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PLANT AND SOIL RELATIONSHIPS IN THE NORTH-EASTERN DESERT, EGYPT

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The present study analysis the plant-soil relationship in the North-Eastern Desert of Egypt. Fifty stands were examined and the matrix of 15 species x50 stands based on species cover data, was classified using Two Way Indicator Species Analysis (TWINSPAN) and ordinated using Detrended Correspondence Analysis (DCA). Three vegetation types were generated after the application of TWINSPAN technique. These groups are named after the dominant perennial species as follows: *Alhagi maurorum (Medio), Tamarix nilotica (Ehrenb) Ege, Zygophyllum coccineum* (L), *Halocnemum strobilaceum* (M. Bieb) as well as, *Parkinsonia aculata* (L). The association of dominant perennials with certain soil variables, the sand, particles moisture content, capacity, porosity, calcium carbonate content organic carbon, pH, chlorides, sulphates, T.S.S., K^{+}, Ca^{++} and Fe^{+++} were assessed. Some species are dominant in the study area namely *Alhagi maurorum*, *Cressa cretica* (L), *Zygophyllum coccineum*, *Halocnemum strobilaceum*. *Calotropis procera* (R.Br.) and *Ochradenus baccatus* (Del.). Most vegetation types occur on deep sandy deposits, with coarse and fine sands. *Halocnemum strobilaceum*, *Cressa cretica and Nitraria retusa* (L) dominate on saline areas. Some ecological conditions supporting the various vegetation types are described.

Keywords: eastern desert, soil, elements, soil texture, desert plants

The Eastern Desert consists essentially of back bone of high and rugged mountains running parallel to the Red Sea coast (Said, 1962 and NBU 1993).

The geology of the area to the east of Cairo was outlined by Abd El-Daiem (1971). Quaternary strata cover the major part of the area and are dominant in the Nile Valley and adjacent plains and in the courses of the main wadis. These strata have a maximum thickness of about 240 m and are developed into aeolian sands as well as into fluviatile sands and gravels.

A detailed account of the vegetation types of the Red Sea coastal land of Egypt was given by Kassas and Zahran (1962, 1967 and 1971) and

Zahran (1962, 1964, 1965 and 1977). These studies show that coastal land is organized ecologically into three principal systems; coastal salt marsh, coastal desert plain and coastal mountains. Ecological conditions: tidal and wave ebb and flow movement, sea spray, salt water seepage, character of surface sediments and substratum, land relief, local, and microclimates, etc. are the main factors that limit the type and extent of the plant cover in each system.

Chamberlin (1975) demonstrates that plant community are better indicators than individual species for habitat conditions. The one distinctive feature of most plants growing in arid environments is that they accumulate an increased amount of low molecular weigh water soluble solutes in their cells. This process is known as osmotic adjustment (Masarrat *et al*., 1996). The compounds utilized for osmotic adjustment and the pattern by which their concentrations change in saline and drought-stressed plants have been discussed in a number of reviews (Stewart and Ahmad, 1983; Wyn Jones and Gorham 1983). Smirnoff and Stewart (1985) conclude that the increase in proline content in some plant species reflects increasing salt or drought stress. Moreover, Masarrat *et al*. (1996) showed that carbohydrate content varied significantly among species in the different habitats. Moreover, species growing in water stressed habitat have higher carbohydrates than those of other habitats.

The present work aims to develop data on the soil ecological ranges of some dominant plant species in the Eastern Desert of Egypt. The physiological behaviour of these species in the different habitats is demonstrated. The present study dealt with the size frequency distribution of five common shrups in the study area. The dominant perennial plant species in the Eastern Desert (from Fayed to Al Ain El-Sokhna) is identified, using two techniques of multivariate analysis (TWINSPAN and DCA). The effect of soil factors on species diversity and bundance of the identified vegetation types are assessed.

The Study Area

The study area lies in the North Eastern Desert of Egypt (30°30′ N long. and 32° 15′ E latit., Fig. 1). The Meterological data illustrated in table (1) shows:

1- The mean maximum air temperatures vary from 18.5°C to 36.2°C in January and August, respectively. The mean minimum air temperatures vary from 7.5°C to 20.9°C, respectively.
2- The monthly mean values of relative humidity differ from 64.7% (December), to 49.6% (May).
3- Wind velocity in the study area is generally light. The average wind velocity ranges from 9.5 km/hr in April to 6.3 km/h in December.
4- Evaporation rate ranges between 6.0 mm/day in December and 13.2 mm/day in June.

5- Most of the rainfall occurs during November to March. Summer is virtually dry. The mean value was 6.7 mm in February while the lowest value was 2.2 mm in March.

TABLE (1). Seasonal fluctuation of climatic factors at the Suez Province. (Average of 6 years from 1983 to 1988). Data obtained from Metriological Department, Cairo.

Parameters / Months	Temperature (°C)			Relative Humidity %	Wind velocity km/hr.	Evaporation mm/day	Rainfall (mm)
	Mean Max.	Mean Min.	Mean Monthly				
January	18.5	7.5	12.88	62.50	7.80	5.70	6.73
February	19.96	7.8	13.8	56.90	8.73	7.55	2.60
March	22.90	9.85	16.29	22.45	9.40	8.46	2.15
April	27.31	13.20	20.20	49.00	9.53	11.13	0.00
May	31.55	16.70	24.09	47.60	9.13	12.64	0.00
June	34.04	19.30	26.54	50.00	9.10	13.10	0.00
July	34.28	20.24	27.05	53.13	8.07	11.80	0.00
August	36.21	20.75	27.06	28.48	8.23	10.88	0.00
September	33.00	19.70	25.64	59.83	8.45	10.30	0.00
October	28.36	15.95	21.97	26.20	7.45	8.31	0.00
November	24.11	12.60	18.28	26.60	6.50	6.58	2.60
December	19.39	8.08	13.61	64.68	6.30	5.25	5.23
Mean Ann.	33.07	17.2	24.8	54.7	9.87	11.17	1.901

MATERIALS AND METHODS

Six locations were selected in the Eastern Desert (from Fayed to Al Ain El-Sokhna) (Fig. 1). Each location has a reasonable degree of habitat and plant cover homogeneity, *i.e.* dominated by one species were chosen.

Soil Analysis

A composite soil sample was collected from each stand as a profile of 45 cm depth. Soil was air dried and passed through a 2 mm sieve and stored in paper bags. Physical and chemical analysis of soil properties were determined following Piper (1947), Rietmeire (1951), Johnson and Ulrich (1959) and Jackson (1962).

Vegetation Analysis

Fifty stands (10 x 10 m each) were distributed in the study area. These stands covered the main physiographic variations of the region. In selecting each stand, care was taken to ensure reasonable degree of physiographic and physiognomic homogeneity. Stands were located from Fayed to Al Ain El-Sokhna during the years 1997, 1998 and 1999 and mean values obtained.

A count-floristic list was carried out for each stand. Relative frequency density and relative cover for perennial species were determined by using the quadrats method Misra 1980). The sum of the relative

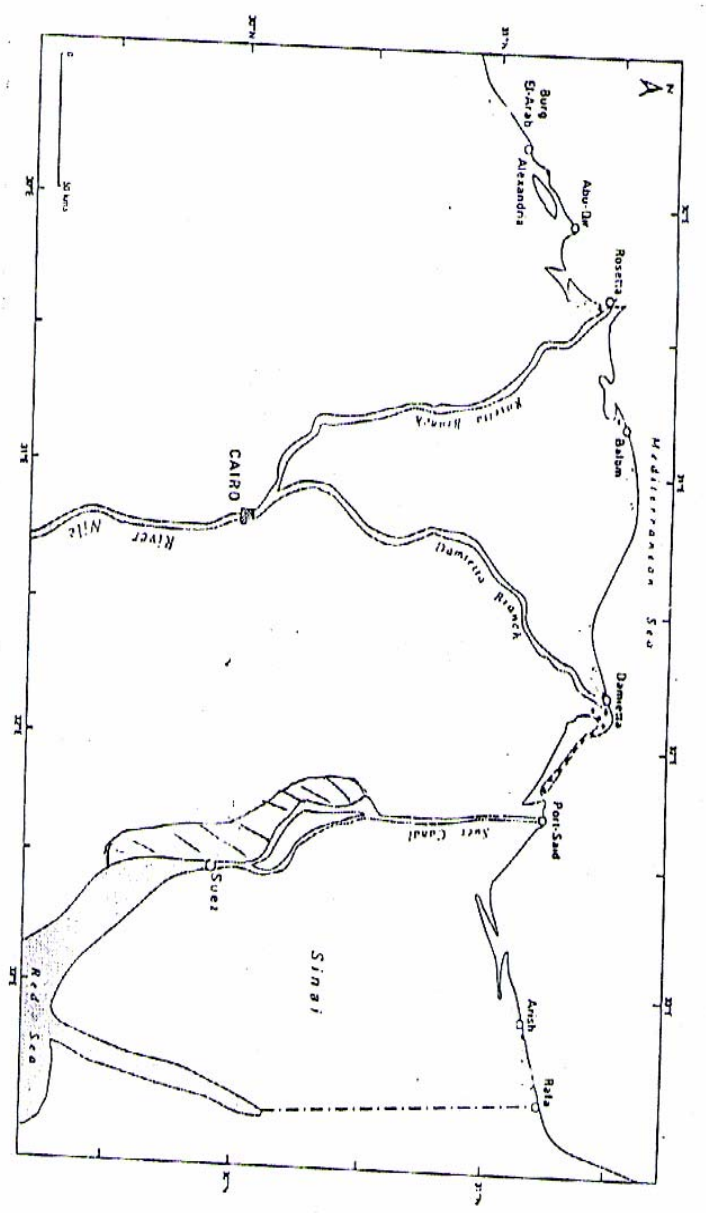

Fig. (1). A map of the Northern Eastern part of Egypt showing the study area
Dashed lines represent the study area

frequency, relative density and relative cover gave the importance value (IV) relative out at 300 as following:

Absolute Frequency (A.F.) = Number of quadrats of occurrence of a plant species ×100/ Total number of quadrats used in a stand.

Absolute Density (A.D.) = Total Number of plant species in studied quadrats × 100 / Total Number of quadrats studied × area of quadrat.

Absolute Cover (A.C.) = Total area cover of plant species ×100 / Number of quadrats used × Area of quadrat.

Relative Frequency (R.F.) = Absolute frequency of a species ×100 / Total absolute frequency of all species.

Relative Density (R.D.) = Absolute density of a species ×100 / Total absolute density of all species.

Relative Cover (R.C.) = Absolute coverage of a species × 100 / Total absolute coverage of all species.

Importance value = Relative Frequency + Relative Density + Relative Coverage. i.e. I.V. = R.F. + R.D. + R.C.

Nomenclature was done according to Tackholm (1974). Similarity between different stands was assessed using a Two-Way Indicator Species Analysis (TWINSPAN). The Detrended Correspondance Analysis DCA was used as an ordination method following the procedure of Hill (1979b).

Plant Analysis

The plant material was collected during the years of 1997, 1998 and 1999 and was washed under running tap water, followed by distilled water. Plant shoots were divided into two portions for each year. One portion was used for determination the chlorophyll content (Metziner *et al*., 1965), proline (Bates *et al*., 1973) and relative water content (Turner, 1981). Water content was done using the following equations:

Water content (%) = (Fresh weight – dry weight/dry weight)× 100

The other portion was oven dried with circulating air at 70°C and then ground. The dried powdered sample was extracted with hot ethyl alcohol-distilled water to determine the carbohydrates fractions (Naguib, 1963 and 1964). The degree of succulence was calculated as a fresh weight/dry weight ratio following Dehan and Tal (1978) and ash elemental composition (Ward and Johnson, 1962) for each year.

RESULTS

Soil Analysis

Soil characteristics exhibit a wide range of variation through different localities (Table 2), habitats classified into three groups (A, B and C) according to soil character as in table (2). Soil texture revealed that sand was the dominant fractions in all localities. Soil supporting vegetation group (A) has the highest value of porosity (53.2%), medium sand content (51.1%), water holding capacity (36.5%), coarse sand (26.3%), calcium carbonate (17.3%) and fine particles (16%) but the lowest of sulphates (0.3%). Group (B) has the lowest value of sulphates (0.2%), porosity (48.7%),

medium sand (47.6%), coarse sand (35.1%), water holding capacity (31.7%) and calcium carbonate (15.7%). Water holding capacity (41.1%), porosity (25.1%), calcium carbonate (17.5%) and K (16.5%) but the lowest value of chlorides (0.3%).

TABLE (2). Mean and standard deviation of the soil variables recorded in different TWINSPAN groups.

Edaphic factors	TWINSPAN group		
	A	B	C
% coarse sand	26.3±8.9	35.1±8.3	11.7±1.3
% medium sand	51.1±2.7	47.6±5.5	55.7±3.7
% fine sand	12.6±5.1	8.7±.1	22.8±5.2
% fine particles	16.0±5.3	7.0±3.3	13.5±3.8
% moisture content	8.3±1.5	10.1±5.4	11.1±6.8
% water holding capacity	36.5±4.8	31.7±10.3	41.1±2.5
% porosity	53.2±9.8	48.7±7.7	25.1±2.6
% calcium carbonate	17.3±1.6	15.7±1.1	17.5±1.5
% organic carbon	0.9±0.1	1.1±0.2	0.4±0.1
pH	7.6±0.3	7.5±0.2	7.1±0.2
% chlorides	0.4±0.2	0.5±0.3	0.3±0.1
% sulphates	0.3±0.1	0.2±0.1	0.5±0.1
% TSS	1.7±0.9	1.6±0.6	1.5±0.6
K mg/g air dry soil	8.6±2.6	13.4±4.8	16.5±2.1
Ca mg/g air dry soil	4.1±0.7	5.1±0.5	5.2±0.1
Fe mg/g air dry soil	1.5±0.6	3.5±1.6	0.9±0.2

Vegetation Analysis

Table (3) shows the floristic composition of plant communities in some localities in the Eastern Desert from Fayed to El Ain El-Sokhna (Fig. 1). Three vegetation groups (VG) were generated at the division of TWINSPAN (Fig.2). The results of application of DCA indicates a reasonable segregation among these groups along the ordination plane of axes (1) and (2) as shown in fig. (3). The dendrogram resulting from the group analysis of stand representing the study area, shows three vegetation groups (Fig. 3,4,5 and Table 2). Group (A) has one stand dominated by *Alhagi maurorum* (IV=212.65/300). Group (B) comparises three stands (2,3 and 4), where stand (2) dominated by *Tamarix nilotica* (IV = 175.24%), stand (3) dominated by *Zygophyllum coccineum* (IV = 236.38%) and stand (4) dominated by *Halocnemum strobilaceum* (IV = 89.8%). Group (C) has one stand dominated by *Parkinsonia aculata* (P = 100%).

TABLE (3). Average importance values (IV) (out of 300) of the perennial species in the five vegetational groups resulting from the TWINSPAN technique. Repetition of some species in more than one vegetational group indicates the overlap of species distribution in the Eastern desert (from Fayed to Ain El-Sokhna) species are arranged in every group in descending order to the importance value P=presence.

Species	IV	Species	IV	Species	IV	Species	IV	Species	P(%)
Group A		Group B						Group C	
Stand I (Group I)		Stand 2		Stand 3		Stand 4		Stand 5	
Alhagi maurarum	212.65	*Tamarix nilotica*	175.24	*Zygophyllum occineum*	236.38	*Halcocnemum strobiliaceum*	78.70	*Parkinsonia aculata*	100
Cressa cretica	61.17	*Alhagi monrorum*	66.32	*Ochradenis baccatus*	57.96	*Alhagi maurarum*	89.8	*Zilla spinosa*	80
Tamarix nilotica	26.32	*Cressa cretica*	50.24	*Acacia chrenbergiana*	5.47	*Nitraria retusa*	63.66	*Zygophyllum coccinenum*	70
		Zygphollum coccineum	8.22			*Cressa cretica*	34.02	*Limonium pruinosum*	70
						Zygophyllum ococcineum	33.8	*Haloxylon salicornicum*	60
								Halocnenum strobilaceum	50
								Phragmites australis	50
								Tamarix nilotica	30
								Fagonia Arabica	30

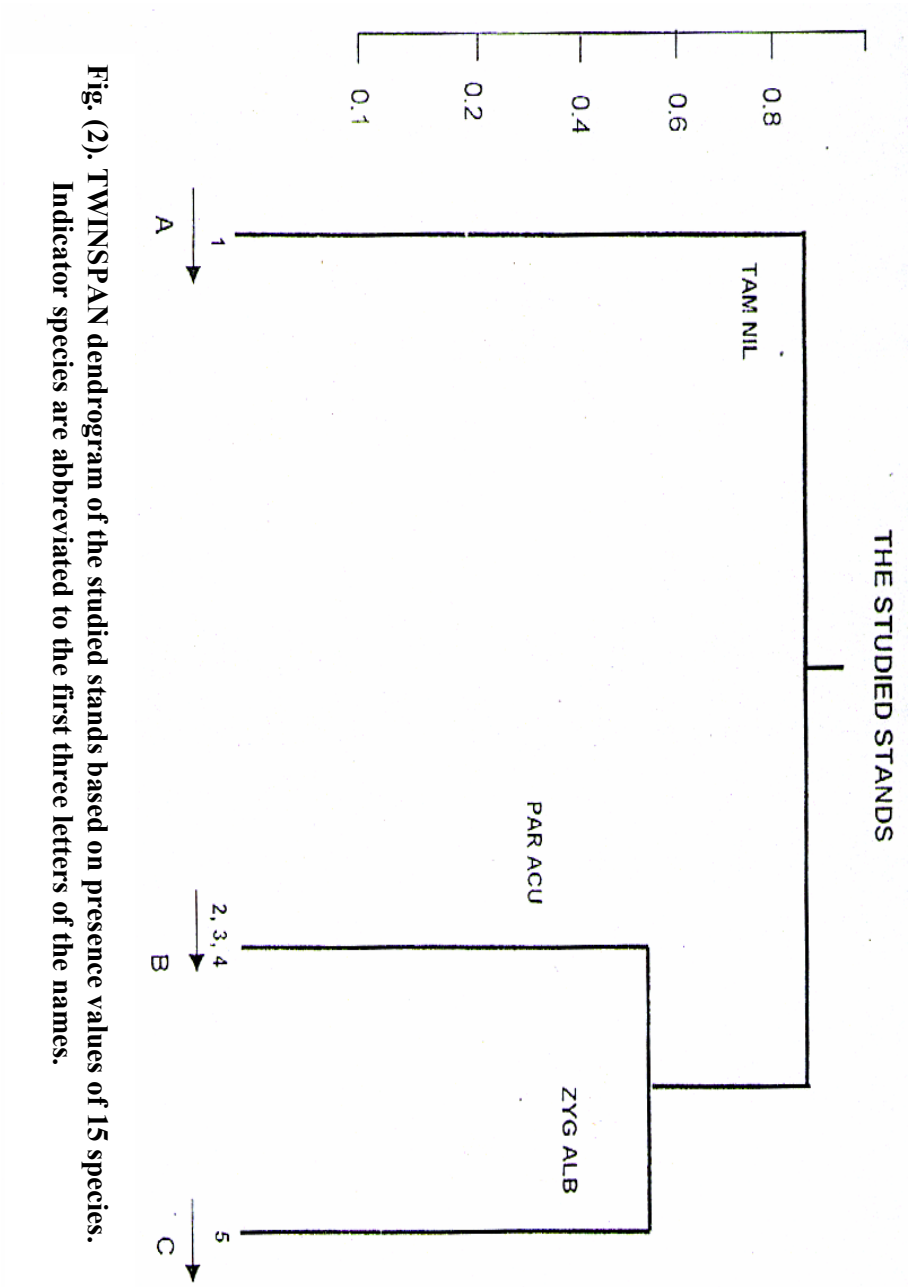

Fig. (2). TWINSPAN dendrogram of the studied stands based on presence values of 15 species. Indicator species are abbreviated to the first three letters of the names.

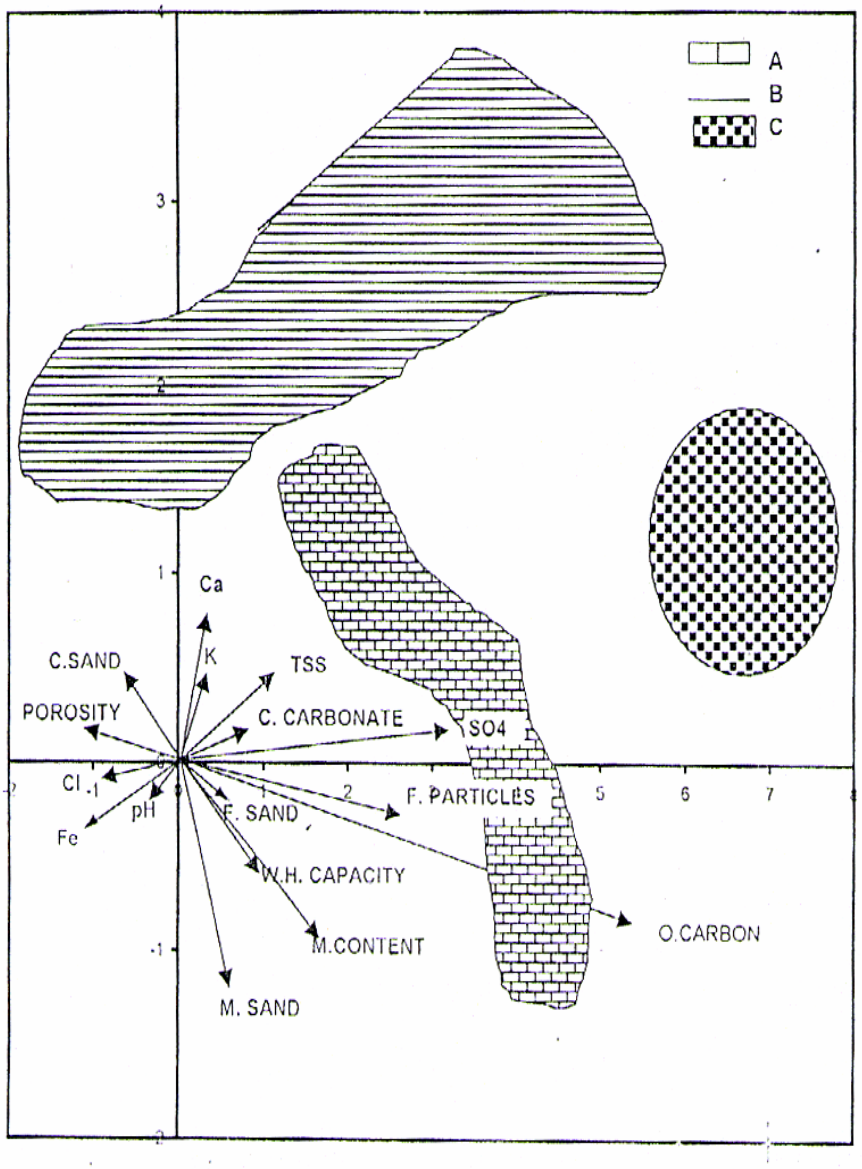

Fig. (3). DCCA ordination of the studies stands with TWINSPAN groups superimposed and environmental factors.

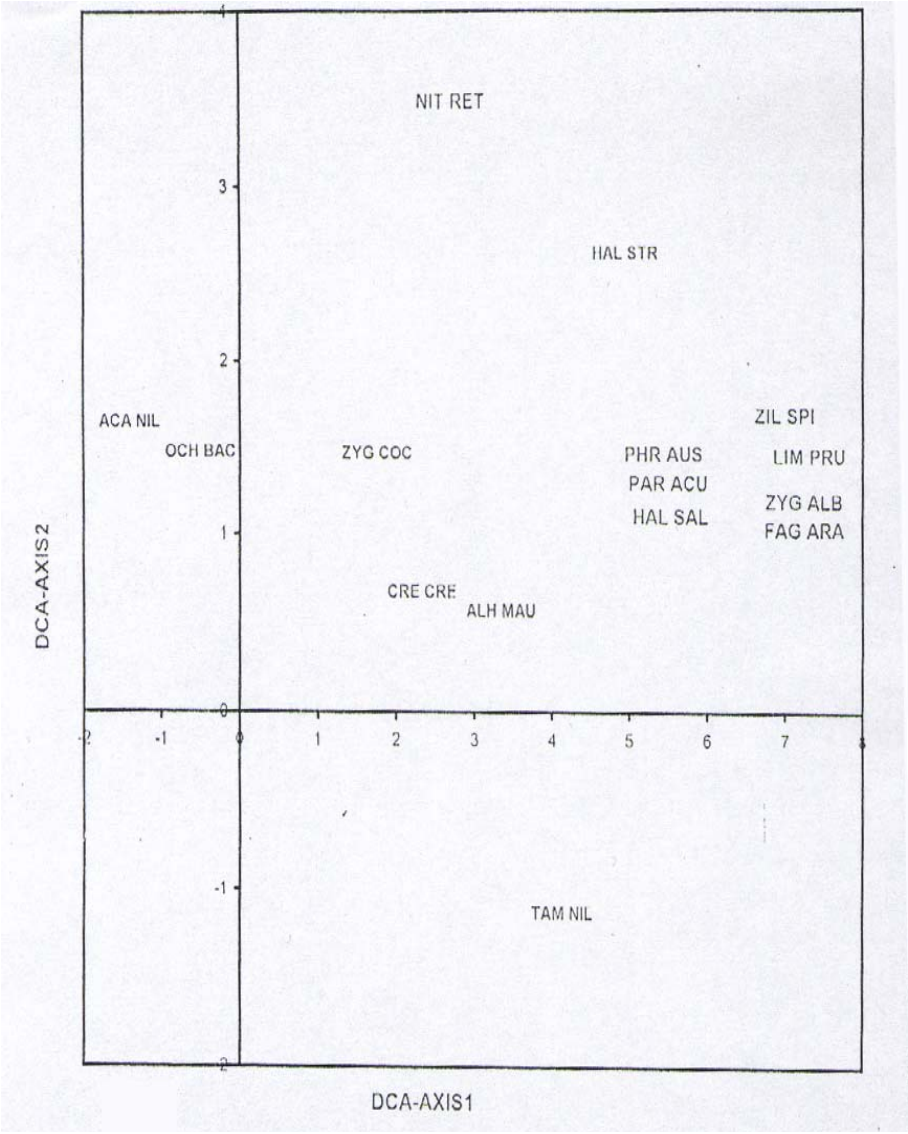

Fig. (4). DCA ordination of 15 species, with the names abbreviated to the three first letters of the genus and species.

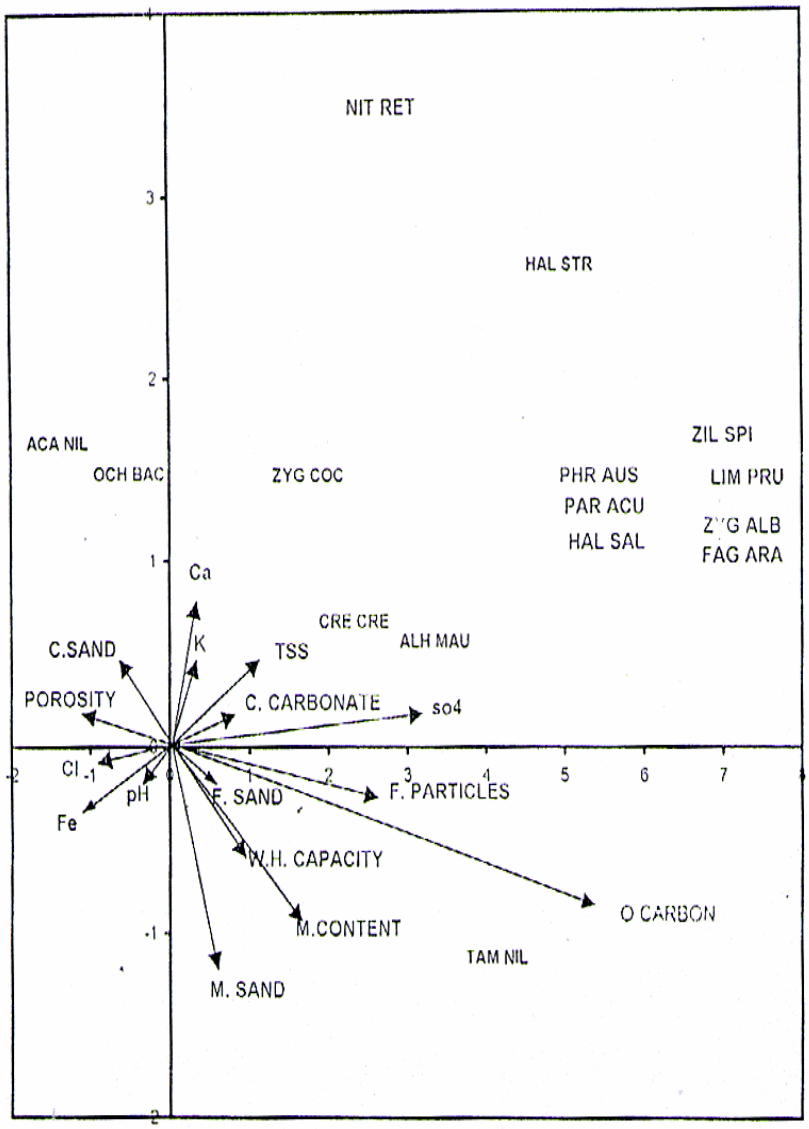

Fig. (5). DCCA species – environment biplot, with arrows and points indicating environmental factors and species respectively.

Plant Analysis

Plant analysis is shown in table (4). Results demonstrate variation in the water content, ash content and mineral ion content of shoots of the dominant species in the different habitats. Water content values ranged from 107.20 to 687.71%. The highest value of water content (687.71%) was recorded in *Calotropis procera*, while the lowest value (107.20%) was recorded in *Cressa cretica*. The relative water content varied from 56.88 to 87.09%.

The highest succulence value (7.88) was recorded in *Calotropis procera,* while the lowest succulence (2.07) was in *Cressa cretica*. The total ash content was high in the dominantd species in all localities and ranged between 6.50 in *Halocnemun strobilaceum* and 33% in *Nitraia retusa*.

Chlorophyll content was generally low in most species. The pigment content varied from 0.117 to 0.299 mg/g fresh weight for chlorophyll (a) amounted. The highest value of chlorophyll (a) was 0.299 mg/g, fresh weight was recorded in *Cressa cretica,* while the lowest value of 0.117 mg/g, fresh weight was recorded in *Halocnemum strobilaceum*. The values of chlorophyll (b) ranged between 0.081 and 0.287 mg/g fresh weight. The highest value of chlorophyll (a) and (b) were recorded in *Ochradenus baccatus*, while the lowest value found in *Halocnemum strobilaceum*. The highest value of carotenoids amounted 0.048 mg/g, fresh weight was recorded in *Ochradenus baccatus* and the lowest value of 0.018 mg/g, fresh weight was found in *Zygophyllum coccineum.* The chlorophyll a/b ratio ranged between 1.04 in *Ochradenus baccatus* and 1.44 in the *Halocneum strobilaceum*.

The total soluble sugars ranged between 1.53 and 8.98 mg/g dry weight (Table 4). The highest value of 8.98 mg/g dry weight soluble sugars was found in *Cressa cretica*, while the lowest value of soluble sugars 1.53 mg/g dry weight was found in *Zygophyllum coccineum*.

The proline content varied from 0.002 and 0.09 mg/g fresh weight. The highest level of proline content amounted 0.09 mg/g fresh weight was recorded in *Ochradenus baccatus*, while the lowest value of 0.002mg/g fresh weight was recorded in *Zygophyllum coccineum*.

DISCUSSION

Three vegetation types were generated after the application of two way indicator species analysis (TWINSPAN:Hill, 1979a) to the abundance of 15 species in 50 stands. The application of detrended correspondence analysis (DCA:Hill, 1979 b) to the same set of data supports the distinction between the three vegetation groups. Vegetation types are dominated by: *Alhagi maurorum, Tamarix nilotica, Zygophyllum coccineum, Halocnemum strobilaceum* and *Parkinsonia aculata*.

TABLE (4). Variations in water content (WC), relative water content (RWC), succulence, chlorophyll content, total soluble carbohydrate TSC), proline content and total ash content in leaves collected from the Eastern Desert ± standard error.

Locality and species	WC%	RWC%	Succulence	Chlorophyll content mg/g fresh weight				TSC mg/g dry weight	Proline mg/g fresh weight	Total ash content %
				Chlorophyll a	Chlorophyll b	Carotenoids	Chlorophyll A/b ratio			
Cressa cretica	107.2 ±2.5	56.85 ±0.161	2.078 ±0.9	0.299 ±0.003	0.271 ±0.001	0.060 ±.0.001	1.10 ±0.30	8.98 ±0.059	0.01 ±0.0002	19.5 ±0.118
Zgyophyllum coccineum	385.60 ± 4.1	79.85 ±1.09	4.86 ±0.87	0.175 ±0.0012	0.142 ±0.001	0.018 ±0.002	1.23 ±0.12	1.53 ±0.034	0.002 ±0.0008	30.50 ±0.271
Halocnemum strobilaceum	179.38 ±3.2	71.63 ±0.19	2.79 ±0.55	0.117 ±0.0013	0.081 ±0.003	0.013 ±0.002	1.44 ±0.43	4.71 ±0.042	0.006 ±0.0016	33.00 ±0.41
Calatropis procera	687.71 ±5.9	87.09 ±0.112	7.88 ±0.68	0.198 ±0.002	0.146 ±0.001	0.033 ±0.004	1.36 ±0.20	1.56 ±0.306	0.02 ±0.002	13.00 ±0.028
Ochradenus baccatus	158.31 ±2.4	58.16 ±0.19	2.58 ±0.45	0.298 ±0.0005	0.287 ±0.002	0.048 ±0.001	1.04 ±0.25	3.89 ±0.099	0.09 ±0.0009	6.50 ±0.066
Nitrararia retusa	250.29 ±1.9	57.37 ±0.112	3.50 0.46	0.20 ±0.0012	0.160 ±0.0002	0.02 ±0.002	1.25 ±0.6	8.17 ±0.033	0.018 ±0.0007	6.50 ±0.041

Plant communities are affected by the fine sediments which may retain seeds stem or root fragments and specialized organs such as tubers or turions (Khedr and Hegazy, 1998).

The vegetation of the Eastern Desert is less prominant as a component of the plant cover than of other phytogeographical regions of Egypt. The soil is mainly formed of coarse sand and may develop in certain localities of high salinity. The underground water is deep. The distribution of the community types within the surveyed area is mainly affected by soil attributes and the ability of species to adapt themselves against the prevailing conditions (Shams and Abd El-Fattah, 1989). Kassas and Imam (1957) stated that the desert landforms cause concentration of available water in favoured areas, where the plants may live. They added that this is one aspect of microhabitat phenomena.

Several investigators stated that the shortage in soil moisture was the most effective environmental factor affecting the pattern of plant growth in desert habitat (Johns, 1984; Watkinson, 1985; Ayyad and Ghabbour, 1986; Willams and Hobbs, 1989 and Abd El-Fattah, 1994). Microhabitats influence the local distribution of plants and floristic composition of the community types. Moreover, species of desert plants differ in their association amplitude according to microhabitat (Kassas and El-Abyad, 1962).

The study of floristic composition of plant communities in the different localities may provide an indicator of soil salinity, soil moisture content and soil reaction as well as the behavior of the dominant species in this habitat (Abd El-Fattah, 1994).

Under the conditions of the surveyed area, *Alhagi maurorum* is species of the wide ecological amplitude and sociological range. The species is recorded in 80% of community types. *Tamarix nilotica*, *Zygophyllum coccineum* and *Cressa cretica* are sub-dominant species recorded in 60% of the comminutes types. The other species have presence value of 20%.

It would appear from this study that species of different localities in the Eastern Desert are subjected to large variation in edaptic factors, especially $CaCO_3$, moisture content and total soluble salts. These factors exhibit a wide range of variation between the different localities than other soil characteristics. Variation in these edaphic factors demonstrates species variation in different localities in arid zones (El-Ghonemy, 1966 and 1974).

It has been demonstrated by Rozema *et al*. (1983 and 1985) that the decrease in the maritime influence along the transect of the area has an impact on the vegetation composition and nature of characteristic species, and this is confirmed by the present study. However, the data also indicate that the decrease in salinity, plays a key role in the replacement of one species by another along the transect. This has also been suggested by Joenje (1978).

The present study demonstrates the highest percentage of medium sand in soils of *Parkinsonia aculata*, total soluble salts and organic carbon in soils of *Halocnemum strobilaceum,* while the lowest percentage of medium sand in soils of *Halocnemum strobilaceum*, total soluble salts in soils of *Calotropis procera*. *Cressa cretica* tends to concentrate greater amounts of certain metabolic components in shoot. This may indicate that the plant is subjected to greater environmental stress. Vegetation surveys (Abd El-Rahman and El-Monayeri, 1967) indicate that the species is confined to sandy coastal soils which are calcareous, poor in organic carbon, fairly alkaline, and with very low values of water soluble salts. Leaf water content, chlorophyll and pH were higher.

The total soluble sugars attained the highest values in *Cressa cretica* followed by *Nitraria retusa,* while the lowest value was attained in species of more xeric habitats (*Zygophyllun coccineum).*

Turner and Kramer (1980) and Pitman (1980) reported that water deficits in plants brought about by higher soil moisture tension, greatly modify their metabolic products. Increased translocation of carbohydrates into shoots or decrease in carbohydrates from shoots could also contribute to other in sugar accumulation (Munns *et al*., 1979).

Several attempts have been made to use proline accumulation to evaluate tolerance or sensitivity of plants to stress (Stewart and Larher, 1980; Rozema *et al*., 1983). Stress compatible solute, proline and carbohydrate contents were greater in the tissues. The habitats characterized by their high level of total soluble salts and $CaCO_3$. Usually, the function of increased concentration of compatible osmotic solutes such as amino acids, proline and methylated quaternary ammonium compounds and polyols is assumed to prevent the inactivation of enzyme and other essential structures by salinity stress (Borowitzka, 1981; Wyn Jones and Storey, 1981).

It can be concluded that the plant cover used as indicator to habitat conditions as:

a- The community dominated by *T. nilotica* associated with soil of fine particles.
b- The community dominated by *P. aculata* associated with courser soil particles.
c- The community dominated by *Z. album* associated with soil of high medium sand and K content.

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علاقة النبات بالتربة فى المنطقة الشمالية للصحراء الشرقية بمصر

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تهدف هذه الدراسة إلى التعرف على بعض الوحدات الرئيسية للكساء النباتى الطبيعـى فى الصحراء الشرقية بين فايد والعين السخنة بغرض القاء الضوء على العوامل التى يحتمـل أن تكون سبباً فى التوزيع النباتى فى هذه المنطقة وقد وجد أن هناك مجتمعات نباتية رئيسية يسودها *Alhagi maurorum Tamarix nilotica Zygophyllum coccineum Cressa cretica Halocnemum strobilaceum, Parkinsonia aculata Calotropis procera and Ochradenus baccatus* والتربة فى هذه المنطقة ذات طبيعة رملية مختلطـة وخشـنة فـى الغالب وتتميز بملوحة عالية نسبياً فى بعض المواقع وأن الماء الجوفى على عمق كبير.

وقد أمكن التعرف على الظروف البيئية لكل عشيرة كذلك السلوك السوسيولوجيى لكـل نوع نبات سائد فى العشائر المختلفة، كذلك درس السلوك التأقلمى لكل نوع سائد، حيـث وجـدت أختلافات جوهرية فى محتوى النباتات المدروسة "السائدة" فى كل من المحتوى المـائى والمـادة الحية كذلك فى الصبغات النباتية أيضاً.

قدر محتوى النباتات من بعض المواد الأيضية وظهر أن هناك أختلافات كبيـرة فـى محتوى النباتات من الكربوهيدرات والبرولين.

كشفت المعلومات عن أنسب البيئات لكل نوع نباتى كذلك مدى تحمل النبـات ظـروف البيئة الذى يوجد بها.

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ECONOMIC POTENTIALITIES OF SOME PLANTS GROWING NATURALLY IN THE NILE DELTA REGION, EGYPT

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Flora of Egypt appeared promising as raw materials for various uses e.g. industrial, grazing, pharmaceutical, etc. The species growing naturally in the Nile Delta region namely: *Bidens pilosa, Digitaria sanguinalis, Echinochloa crus-galli, Lactuca serriola, Lepidium sativum, Lolium perenne, Malva parviflora, Paspalidium geminatum, Portulaca oleracea* and *Saccharum spontaneum* had been investigated. The preliminary phytochemical screening revealed the presence of carbohydrates, sterols, alkaloids, flavonoids, saponins, chlorides and sulphates in shoot system of all the studied plants. Moisture, ash, water soluble ash, acid insoluble ash, total nitrogen, total proteins, total lipids, crude fibre, glucose, sucrose, total soluble sugars and polysaccharides together with some elements were estimated. The highest values of total proteins and lipids were estimated in *Saccharum spontaneum,* while the highest total carbohydrates were measured in *Lactuca serriola*. The elementary analysis of the studied plants indicate that potassium, sodium, and calcium were the main cations. Quantitative and qualitative analysis of the protein amino acids revealed the presence of seventeen amino acids with high values of aspartic acid, glutamic acid and proline. These results indicate that these selected plants may be used as highly potential natural plants.

Keywords: weed flora, carbohydrates, amino acids, fatty acids, elements.

There are an excessive global demands for food, forage and agro-industrial raw materials. The Nile Delta region flourished by many weeds. Among the common wild flora of Damietta region, the authors chose ten species to evaluate their chemical constituents. The genera of these plants have attracted the attention of workers in many countries. In genus *Bidens*, polyacetylene, flavonoids, methoxylated flavone glucosides and chalcone ester glucosides were reported (Alez, *et al*. 1996; Wang, *et al*. 1997;

Brandao *et al*., 1998 and De Tommasis *et al*., 1998). Forage yield, crude protein, minerals, starch, ash, protein and lipids were studied in genus *Digitaria* (Shy *et al*., 1995; Santana and Mc Dowell, 1996 and Shatters and West, 1996). Takatsuto and Kawashima (1998); Turrner, *et al*. (1998) and Watanabe (1999) studied polysterols, cystathionine B-layse, antioxidative phenolic compounds in genus *Echinochloa* respectively. In genus *Lactuca*, nitrate, vitamin C, B-carotene, lutein, reducing sugars, chlorophyll, minerals, flavonoids and germacolide glucoside were investigated by Drews and Krumbien (1997); Kisiel (1998) and Kisiel and Braszcz (1998). Lipids, carbohydrates, minerals, proteins, fatty acids, alkaloids, fibers, inorganic salts, amino acids and sterols were studied in genus *lepidium*, by certain authors (El-Shintinawy and Selim, 1995; Comas, *et al*., 1997; Bettach, *et al*., 1997; Maier, *et al*., 1998; Andersson, *et al*., 1999). In genus *Lolium*, Tase, *et al*. (1996); Marstop (1996) and Saito, *et al*. (1999) studied the proteins, amino acids, carbohydrates and B-carotene content, respectively. Sulfite oxidase enzyme, polysaccharides and sterol were studied by Ganai, *et al*. (1997); Atkhomova, *et al*. (1998) and Sharma and Ali (1999) in genus *Malva*. Sakai, *et al*. (1996); Boehm and Boehm (1996); Ohsak *et al*. (1997) and Garti, *et al*. (1999) studied the monoterpene glucosides, betalains, fatty acids, clerodane diterpenoid and gums in genus *Portulaca*. Lingle (1997) studied the sugars in genus *Saccharum*. From the above screening of literature, one can expect the prime importance of individuals belonging to these genera. The present study is a contribution to the previous investigation. It aims at the quantitative evaluation of the nutritive and economic potentialities of the following wild taxa in the Nile Delta: *Bidens pilosa, Digitaria sanguinalis, Echinochloa crus-galli, Lactuca serriola, Lepidium sativum, Lolium perenne, Malva parviflora, Paspalidium geminatum, Portulaca oleracea* and *Saccharum sportaneum*.

MATERIALS AND METHODS

During the year 1999, several field trips were organized to Damietta Province for collecting the samples of the concerned plants. *Digitaria sanguinalis, Lolium perenne and Paspalidium geminatum* were collected from Damietta district. *Biden spilosa, Lactuca serriola* and *Lepidium sativum* were collected from Kafr-Saad district, *Malva paroiflora* and *Portulara oleracea* were obtained from Farskor district. while *Echinochloa crus-galli* and *Saccharum spontaneum* were obtained from El-Zarka district. The shoot system of each species was cleaned, air dried in shade and ground to fine powder and preserved in a well stopped bottles ready for chemical analyses.

After air drying, moisture contents of each sample were studied according to Ward and Johnson (1962). Total ash, water soluble ash and acid

insoluble ash were determined according to Egyptian Pharmacopoea (1953). Total soluble sugars, glucose, sucrose and polysaccharides were determined according to Yemm and Willis (1954); Feteris (1965) and Thayumanavan and Sadasivan (1984). Crude fiber and total lipids contents were determined according to A.O.A.C. (1970). Total nitrogen content was determined according to Delory (1949) and Naguib (1964). Protein content was determined according to the method of Bradford (1976).

The preliminary phytochemical screening of different speices were studied according to Egyptian Pharmacopea E.P. (1953). Sodium, potassium, calcium, magnesium, iron, manganese, zinc, copper, lead and cadmium were determined by atomic absorption spectrophotometer using the method described by Allen *et al*. (1974).

The identification and quantitative determination of amino acid composition in the plant powders were carried out according to Moore and Stein (1958).

The cluster analysis using Bray-Curtis dissimilarity index under the Multivariate Statistical Package MVSP program is an explicit way of identifying similar groups in raw data (Jongman *et al*., 1987).

RESULTS

Preliminary-Phytochemical Screening

It is evident that, the preliminary phytochemical screening revealed the presence of carbohydrates, sterols, alkaloids, flavonoids, saponins, chlorides and sulphates in all the studied plants. Tannins were recorded only in *Bidens pilosa*, *Echinchloa crus-galli*, *Lactuca serriola, Lepidium sativum, Lolium perenne* and *Saccharum spontaneum*. Resin was recorded in all the studied plants except *portulaca oleracea*.

Determination of Certain Constants

Data in table (1) present certain pharmacopoeial constants of the studied species. It is obvious that the percent of moisture content were ranged between 8.93 and 12.64% in *Digitaria sanguinalis* and *Malva parviflora,* respectively. The maximum value of ash content was recorded in *Portulaca oleracea* (16.36%), while the minimum value was recorded in *Lepidium sativum* (7.92%). The highest value of water-soluble ash was 8.98% in *Malva parviflora* followed by 6.28 in *Portulaca oleracea*, 6.08% in *Lactuca serriola*, 5.56% in *Bidens pilosa*, 5.02% in *Paspalidium geminatum*, 4.06% in *Digitaria sanguinalis*, 3.60% in *Lepidium sativum*, 3.22% in *Echinochloa crus-galli*, 2.94% in *Saccharum spontaneum* and 2.56% in *Lolium perenne*. *Digitaria sanguinalis* contained a relatively high percentage of acid-insoluble ash being 5.96%, while *Lepidium sativum* contained a relatively low percentage being 0.54%. The percent of total nitrogen contents ranged between 136.00 mg/100 gm dry weight in *Lepidum*

sativum and 18.50 mg/100 g dry weight in *Digitaria sangiuinalis*. The maximum value of total lipid content (3.87%) was recorded in *Portulaca oleracea,* while the minimum value (0.47%) was recorded in *Echinochloa crus-galli*. *Malva parviflora* recorded high percentage of crude fiber content (48%) followed by *Digitaria sanguinalis* (45%), *Lepidium sativum* (40%), *Lolium perenne* (38%), *Paspalidium geminatum* (33%), *Saccharum spontaneum* (32%), *Lactuca serriola* (30%), *Portulaca oleracea* (30%), *Bidens pilosa* (24%) and *Echinochloa cruss-galli* (23%). The value of protein content was varied between 142.73 to 429.55 mg/100 g dry weight in *Malva parviflora* and *Paspalidium geminatum,* respectively. Concerning carbohydrates, *Lactuca serriola* was recorded the highest value of total soluble sugar, glucose, sucrose and polysaccharides being 151.50, 4.08, 19.37, 388.92 and 563.80 mg/g dry weight, respectively. *Portulaca oleracea* recorded the lowest value of total soluble sugars and sucrose (48.20 and 1.77 mg/g dry weight, respectively) while *Saccharum spontaneum* recorded the lowest value of glucose (0.261 mg/g dry weight) and *Echinochloa crus-galli* in polysaccharides (158.30 mg/g dry weight).

Analysis of Amino Acids of the Studied Plants

Quantitative and qualitative analysis of amino acids of the studied plants are shown in table (2). *Bidens pilosa* recorded the lowest amounts of aspartic acid (0.204 g/100 g dry weight) and the highest amounts of leucine and tyrosine (1.378 and 0.362 g/100 g dry weight, respectively). The lowest amounts of threonine, serine, glutamic acid, glycine, valine, leucine, phenylalanine, lysine and arginin were recorded in *Digitaria sanguinalis* being, 0.285, 0.275, 0.779, 0.293, 0.416, 0.477, 0.341, 0.328 and 0.375 g/100 g dry weight, respectively. The highest amounts of alanine (0.792 g/100 g dry weight) and valine (0.833 g/100 g dry weight) were recorded in *Echinchloa crus-galli*. The lowest amounts of methionine (0.059 g/100 g dry weight) recorded in *Lactuca serriola*; alanine (0.404 g/100 g dry weight), isoleucine (406 g/100 g dry weight) and tyrosine (0.161 g/100 g dry weight) recorded in *Paspalidium geminatum.* While proline (0.591 g/100 g dry weight) and histidine (0.176 g/100 g dry weight) recorded in *Saccharum spontaneum*. The highest amounts of proline (1.951 g/100 g dry weight) and isoleucine (1.039 g/100 g dry weight) recorded in *Lepidium sativum*, glutamic acid (1.580 g/100 g dry weight) and cystine (0.090 g/100 g dry weight) recorded in *Lolium perenne* while glycine (0.758 g/100 g dry weight), methionine (0.106 g/100 g dry weight) and phenylalanine (0.657 g/100 g dry weight) recorded in *Portulaca oleracea*. *Malva parviflora* recorded the highest amounts of aspartic acid, threonine, serine, histidine and lysine being 3.808, 0.951, 0.864, 0.645 and 0.955 g/100 g dry weight, respectively.

TABLE (1). Mean values of different constants and constituents of the studied plants.

Species Constants & Constituents	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Moisture content (%)	10.37	8.93	11.04	11.91	12.06	10.52	12.64	10.52	9.65	9.43
Ash content (%)	15.80	13.18	10.76	12.76	7.92	10.42	14.28	11.96	16.36	11.38
Water-soluble ash (%)	5.56	4.06	3.22	6.08	3.60	2.56	8.98	5.02	6.28	2.94
Acid-insoluble ash (%)	4.30	5.96	3.78	2.34	0.54	5.72	1.00	4.88	3.64	5.00
Total nitrogen (mg/100 gm dry wt.)	44.67	18.50	31.37	30.67	136.00	51.37	18.67	19.30	34.67	23.57
Total protein (mg/100gm dry wt.)	363.64	212.73	250.45	207.27	216.36	295.45	142.73	429.55	220.91	409.55
Total lipid content (%)	0.80	1.80	0.47	0.96	2.07	0.90	1.77	0.83	3.87	3.45
Crude fibre content (%)	24.00	45.00	23.00	30.00	40.00	38.00	48.00	33.00	30.00	32.00
Carbohydrates (mg/g d. wt.):										
Total soluble sugar	60.70	56.90	55.60	151.50	108.30	93.50	60.80	58.40	48.20	53.80
Glucose	0.807	0.706	0.731	4.008	3.050	2.118	0.933	0.958	0.303	0.261
Sucrose	6.23	4.23	2.80	19.37	19.03	8.12	12.92	6.69	1.77	3.20
Polysaccharides	243.31	217.75	158.30	388.92	320.32	358.36	233.99	253.43	280.65	277.40
Total carbohydrates	311.05	279.59	217.40	563.80	450.70	462.10	308.64	319.48	330.92	334.66

1- Bidens pilosa *2- Digitaria sanguinalis* *3- Echinochloa crus-galli* *4- Lactuca serriola*
5- Lepidium sativum *6- Lolium perenne* *7- Malva parviflora* *8- Paspalidium geminatum*
9- Portulaca oleracea *10- Saccharum spontaneum*

TABLE (2). Amino acid analysis (g.A.A./100 g dry weight) of the studied plants.

Species / Amino acid	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	Mean
Aspartic acid	0.204	1.145	2.157	1.493	1.764	1.653	3.808	2.257	1.509	2.547	1.854
Threonine	0.533	0.285	0.475	0.345	0.794	0.650	0.951	0.541	0.570	0.611	0.576
Serine	0.422	0.275	0.455	0.287	0.652	0.574	0.864	0.544	0.504	0.566	0.514
Glutamic acid	1.374	0.779	1.373	0.943	1.523	1.580	1.480	0.878	1.265	1.067	1.226
Proline	1.393	0.693	1.763	0.704	1.951	1.224	1.268	0.964	1.285	0.591	1.184
Glycine	0.489	0.293	0.456	0.342	0.574	0.534	0.698	0.359	0.758	0.372	0.487
Alanine	0.651	0.442	0.792	0.436	0.586	0.568	0.579	0.404	0.620	0.544	0.562
Cystine	0.081	0.051	0.079	0.044	0.062	0.090	0.009	0.041	0.014	0.034	0.051
Valine	0.775	0.416	0.833	0.517	0.809	0.592	0.740	0.464	0.670	0.484	0.630
Methionine	0.126	0.080	0.155	0.059	0.130	0.106	0.151	0.094	0.166	0.124	0.119
Isoleucine	0.927	0.464	0.791	0.573	1.039	0.625	0.881	0.406	0.883	0.493	0.708
Leucine	1.378	0.477	0.892	0.609	0.938	0.736	0.898	0.559	0.902	0.588	0.798
Tyrosine	0.362	0.194	0.356	0.210	0.310	0.247	0.313	0.161	0.316	0.301	0.277
Phenylalanine	0.612	0.341	0.614	0.380	0.548	0.506	0.618	0.356	0.657	0.453	0.509
Histidine	0.322	0.220	0.356	0.228	0.451	0.426	0.645	0.230	0.629	0.176	0.368
Lysine	0.588	0.328	0.613	0.418	0.840	0.567	0.955	0.436	0.798	0.360	0.590
Arginine	0.757	0.375	0.605	0.387	0.775	0.572	0.873	0.523	1.113	0.448	0.643

1- *Bidens pilosa* 2- *Digitaria sanguinalis* 3- *Echinochloa crus-galli* 4- *Lactuca serriola*
5- *Lepidium sativum* 6- *Lolium perenne* 7- *Malva parviflora* 8- *Paspalidium geminatum*
9- *Portulaca oleracea* 10- *Saccharum spontaneum*

Elementary Analysis of the Studied Plants

The elementary analysis of the studied plants were presented in table (3). Sodium concentration showed a wide range of variations, its value ranged from 460 mg/100 g dry weight in *Bidens pilosa* to 2070 mg/100 g dry weight in *Paspalidium geminatum*. Potassium concentration was relatively higher in all the studied plants than that of sodium concentration, it ranged from 1326 mg/100 g dry weight in *Lolium perenne* to 3666 mg/100 g dry weight in *Portulaca oleracea*. *Malva parviflora* recorded the highest percentage of calcium concentration (333 mg/100 g dry weight) followed by *Portulaca oleracea* (312 mg/100 g dry weight), *Lactuca serriola* (165 mg/100 g dry weight), *Bidens pilosa* (158 mg/100 g dry weight), *Lepidium sativum* (144 mg/100 g dry weight), *Saccharum spontaneum* (105 mg/100 g dry weight), *Digitaria sanguinalis* (98 mg/100 g dry weight), *Paspalidium geminatum* (88 mg/100 g dry weight), *Echinchloa crus-galli* (74 mg/100 g dry weight) and *Lolium perenne* (60 mg/100 g dry weight). *Portulaca oleracea* recorded the highest value of both magnesium and iron being 26.32 and 171.42 mg/100 g dry weight, respectively. *Paspalidium geminatum* and *Echinochloa crus-galli* recorded the lowest value of magnesium and iron being 2.76 and 45.72 mg/100 g dry weight, respectively. The maximum value of manganese was recorded in *Echinchloa crus-galli* being 20.00 mg/100 g dry weight while the minimum value was recorded in *Lactuca serriola* being 7.50 mg/100 g dry weight. Zinc concentration in the studied plants was varied between 10.0 and 21.32 mg/g dry weight in *Lepidium sativum* and *Digitaria sanginalis*, respectively. Both *Echinochloa crus-galli* and *Lolium perenne* recorded the highest percentage of copper ion concentrations (5.32 mg/100 g dry weight) while both *Lactuca serriola* and *Paspalidium geminatum* recorded the lowest percentage (2.0 mg/100 g dry weight). The lead ion concentration varied between *Digitaria sanguinalis* (22.22 mg/100 g dry weight) and *Portulaca oleracea* (62.22 mg/100 g dry weight). Cadmium was absent in *Paspalidium geminatum* and *Lepidium sativum* but record a high value in both *Malva parviflora* and *Digitaria sanguinalis* (0.99 mg/100 g dry weight).

Cluster Analysis of the Studied Plants

A total of 41 parameter were used in the multivariant cluster analysis to find out the similarity between different studied plants as represented in dindrograme (Fig.1).

TABLE (3). Concentration of cations expressed as (mg/100 g dry weight) in the studied plants

Element / Species	Na	K	Ca	Mg	Fe	Mn	Zn	Cu	Pb	Cd
1- Bidens pilosa	460.0	2340.0	158.0	8.94	128.56	9.00	15.32	4.00	44.44	0.50
2- Digitaria sanguinalis	552.0	2652.0	98.0	16.04	65.72	11.00	21.32	2.66	22.22	0.99
3- Echinochloa crus-galli	690.0	1950.0	74.0	10.32	45.72	20.00	12.44	5.32	26.66	0.75
4- Lactuca serriola	506.0	2652.0	165.0	6.02	51.42	7.50	16.88	2.00	26.66	0.75
5- Lepidium sativum	506.0	1794.0	144.0	6.50	51.42	10.00	10.00	4.66	44.44	0.00
6- Lolium perenne	1058.0	1326.0	60.0	3.02	100.00	8.50	19.54	5.32	40.00	0.75
7- Malva parviflora	1840.0	2496.0	333.0	8.14	134.28	10.00	17.10	3.32	31.10	0.99
8- Paspalidium geminatum	2070.0	2028.0	88.0	2.76	108.56	12.00	15.76	2.00	31.10	0.00
9- Portulaca oleracea	920.0	3666.0	312.0	26.32	171.42	14.00	12.44	4.66	62.22	0.75
10- Saccharum spontaneum	552.0	2496.0	105.0	5.74	68.56	8.00	13.32	4.00	26.66	0.75

TABLE (4). Comparison between some variables in the studied plants with other Egyptian wild plants.

Present and other studies / Variables		Present study	El-Ghonemy *et al.*, 1977 30 species	El-Heneidy, 1987 36 species	El-Kady, 1987 26 species	El-Shamy, 1995 10 species	Sharaf El-Din, 1998 28 species
Na	mg/g	4.6-20.7	0.7-50.3	-	-	-	2.6-20.0
K	mg/g	13.3-36.7	6.8-99.0	-	5.5-39.8	-	2.4-11.0
Ca	mg/g	0.6-3.3	4.2-29.3	-	2.9-67.3	-	2.0-6.0
Mg	mg/g	0.03-0.26	1.2-20.7	-	1.5-11.9	-	0.7-5.4
Fe	mg/g	0.46-1.7	0.9-8.1	-	-	-	0.3-4.3
Mn	mg/g	0.07-0.20	0.05-0.76	-	-	-	0.02-0.33
Cu	mg/g	0.02-0.05	-	-	-	-	0.001-0.140
Ash	%	7.9-16.4	-	-	5.5-36.0	4.56-21.83	-
Total lipids	%	0.47-3.87	-	7.4-20.8	0.8-8.3	0.52-5.47	-
Total carbohydrates	mg/gm	308-564	-	178-324	271-519	-	-
Crude fiber	%	23-48	-	24.4-28.7	14.6-35.6	17.83-63.29	-
Amino acids	g/100 gm			-			
Aspartic acid		0.20-3.80	-	-	-	0.53-5.32	-
Threonine		0.29-0.95	-	-	-	0.38-1.61	-
Serine		0.28-0.86	-	-	-	0.07-2.57	-
Glutamic acid		0.78-1.60	-	-	-	0.13-8.91	-
Proline		1.95-0.59	-	-	-	0.08-1.88	-
Glycine		0.29-0.76	-	-	-	0.42-2.76	-
Alanine		0.40-0.80	-	-	-	0.07-2.37	-
Cystine		0.01-0.09	-	-	-	0.01-5.78	-
Valine		0.42-0.83	-	-	-	0.13-2.39	-
Methionine		0.06-0.17	-	-	-	0.10-1.13	-
Isoleucine		0.41-1.04	-	-	-	0.67-2.01	-
Leucine		0.48-1.40	-	-	-	0.40-3.83	-
Tyrosine		0.16-0.36	-	-	-	0.17-2.20	-
Phenylalanine		0.34-0.66	-	-	-	0.66-3.10	-
Histidine		0.17-0.64	-	-	-	0.13-1.78	-
Lysine		0.33-0.95	-	-	-	1.25-2.88	-
Arginine		0.37-1.11	-	-	-	0.3-4.36	-

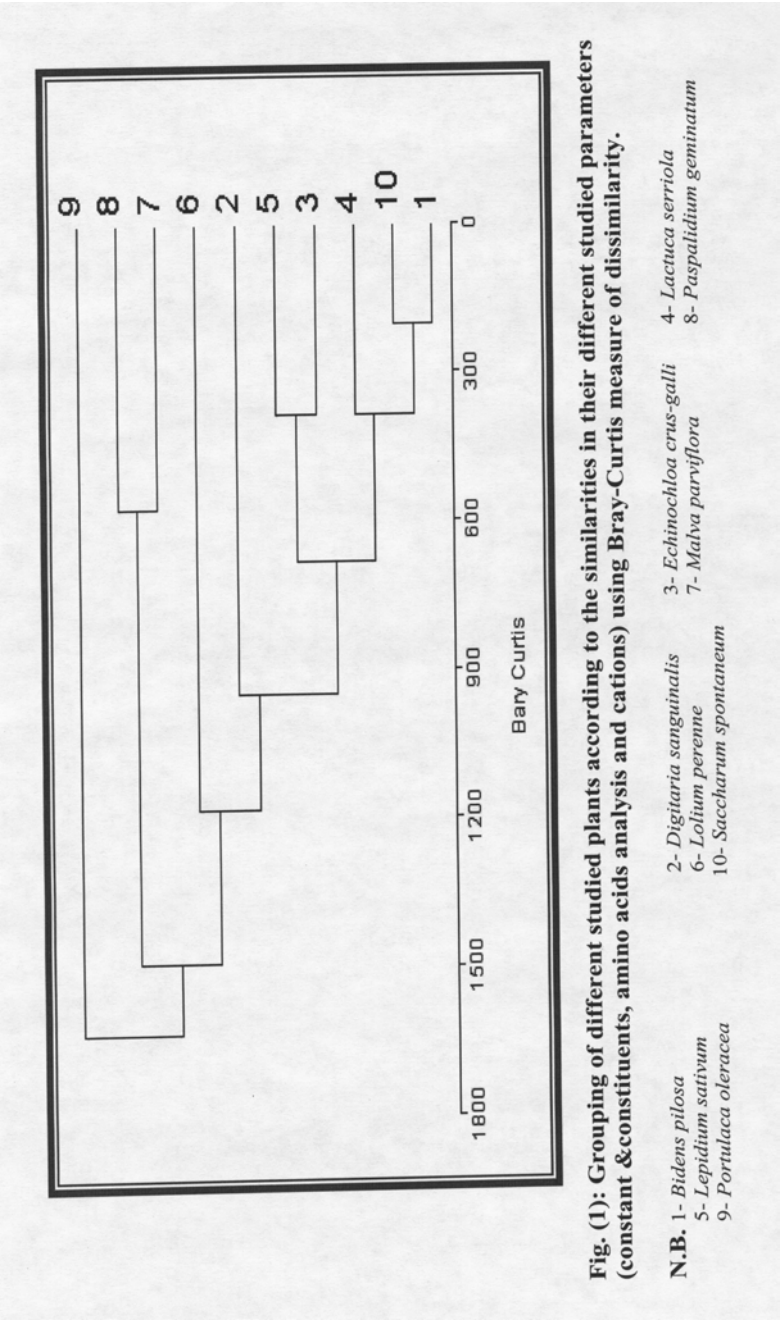

Fig. (1): Grouping of different studied plants according to the similarities in their different studied parameters (constant &constituents, amino acids analysis and cations) using Bray-Curtis measure of dissimilarity.

N.B. 1- *Bidens pilosa* 2- *Digitaria sanguinalis* 3- *Echinochloa crus-galli* 4- *Lactuca serriola*
5- *Lepidium sativum* 6- *Lolium perenne* 7- *Malva parviflora* 8- *Paspalidium geminatum*
9- *Portulaca oleracea* 10- *Saccharum spontaneum*

DISCUSSION

The nutritive value of any forage is dependent upon its content of energy producing nutrients as well as its content of nutrients essential to the animal body. Comparison between nutrient contents of the studied plants and those of the range vegetation in an Egyptian Mediterranean region (El-Ghonemy *et al*., 1977 and El-Kady, 1987) indicated that the studied plants have relatively low contents of Na, K and Ca but high contents of Mg, Fe and Mn. Similar comparison between the studied plants and those growing naturally in the south eastern corner of Egypt was carried out by Sharaf El-Din (1998) who shows that the studied plants have relatively high contents of Na, K, Ca, Mg, Fe, Mn and Cu.

The source of energy for animals are carbohydrates, fats and proteins. The importance of these compounds to plants in terms of structure and use in metabolism is well known. These compounds are elaborated, stored and utilized by the plant itself as food for maintenance and for the development of new shoot and root growth. Comparison between the organic compounds in the studied plants and that of the Egyptian desert plants (El-Heneidy, 1987; El-Kady, 1987 and El-Shami, 1995) indicated that the contents of total lipids and total proteins are lower than those of the other species, while the reverse is true regarding total carbohydrates (Table 4).

Protein content in feeds is extremely important although its value has been over emphasized. Forage high in protein is used for energy and is required for repair and new growth of animal tissue, including such animal products as milk, animal tissues and hair. The present study points out the presence of seventeen amino acids in these species with different concentrations. The concentrations of amino acids are relatively low, compared with those concerned in the study of El-Shami (1995).

From this study, it may concluded that the studied species may be used on a wide range as a fodder plants due to their high contents of carbohydrates, lipids, proteins and minerals. The presence of sterols, flavonoids, tannins, saponins and resin in most of the studied plants may be considered as bases for future pharmaceutical or industrial research programs.

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الأهمية الأقتصادية لبعض النباتات النامية طبيعياً بمنطقة دلتا النيل – بمصر

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يهدف هذا البحث الى إجراء دراسات فيتوكيميائية على عشرة أنواع من النباتات التى تنمو طبيعياً بمنطقة دلتا النيل وهى : شوك الحدائق و الدفيرة والدنيبة وخس البقر وحب الرشاد والجزون والخبيزة والنسيلة والرجلة والقصب البرى وذلك بغرض تقدير أهميتها الأقتصادية.

تم قياس كل من الرطوبة والرماد والرماد الذائب فى الماء والرماد الذائب فى الأحماض ونسبة الألياف وكمية ونوعية السكريات وكمية النتروجين وكمية البروتين وكمية الدهون بهذه النباتات.

تم عمل مسح كيميائى أولى شامل للمواد الفعالة فى هذه النباتات حيث تبين وجود القلوانيات والكربوهيدرات والأستيرويدات والصابونين والفلافونيدات والكلوريدات والكبريتات فى جميع النباتات تحت الدراسة.

تم تقدير عناصر الصوديوم والكالسيوم والبوتاسيوم والحديد والماغنسيوم والمنجنيز والكالسيوم والرصاص والزنك والنحاس ، كما تم التعرف على سبعة عشر حمضاً أمينياً وتركيز كل حمض منهم على حده. وقد أوضحت نتائج الدراسة مايلى :

- النباتات تحت الدراسة تحتوى على مواد عضوية وغير عضوية تؤهلها كنباتات أعلاف للحيوانات.
- المواد الفعالة بها تؤهلها مع مزيد من الدراسة لأستخدامها فى المجالات الطبية والصناعية.

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DIALLEL CROSSES FOR IMPROVING FABA BEAN (*Vicia faba* L.) UNDER RAIN-FED CONDITIONS
I. YIELD AND YIELD COMPONENTS

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The present study was conducted during 1998/99 and 1999/2000 seasons to estimate the types and relative amount of genetic variance components and their interactions with environments for yield and yield components in faba bean. A half diallel set of crosses involving seven parental varieties were utilized under two environments, normally irrigated every 45 days in addition to the amount of rainfall, and with second, dry method of sowing was, used and one supplemental irrigation at sowing, then after, plants were left to grow under rainfall conditions.

Significant genotype mean squares were obtained for all traits in both environments and in the combined data.

The ratio of Specific Combining Ability, S.C.A. x Environment/S.C.A. was higher than of General Combining Ability, G.C.A. x Environment/G.C.A. for all traits except number of pods/plant. The parental varieties Giza blanka and Giza-717 gave significant positive $\hat{g}_i$ for yield and one or more of its components in all crosses. The combination Giza blanka x Giza-461 and Giza-717 x Moshtohor-103 appeared to be the best promising for breeding to increase seed yield per plant which gave significant positive $\hat{S}_{ij}$ for yield and some of its component in both environments as well as the combined data.

Keywords*:* crosses, faba bean, rainfed, heterosis, yield, general and specific combining abilities.

Faba bean (*Vicia faba*, L.) is a protein crop for temperate regions. In Egypt, there is a possibility of increasing the cultivated area. Therefore, it is important to obtain higher yielding varieties through breeding programs for the new reclaimed areas under rain-fed conditions. The breeder should know the type of gene action of the quantitative traits because this is the main

determinate in the choice of selection and breeding procedures. Drought tolerance in native plant species is often defined as survival, but in crop species it should be defined in terms of productivity (Passioura, 1983). Fischer and Maurer (1978) noted that quantification of drought tolerance should be based on grain yield under dry conditions in the absence of an understanding of specific mechanisms of tolerance. Hence, there is a need to look at the methods that has been used to quantify drought tolerance.

The aim of this investigation was to estimate the heterotic performance, and general and specific combining ability in F_1 of Faba bean diallel cross for certain quantitative characters in an attempt to improve yielding potentiality of Egyptian Faba bean under the previous stress conditions.

MATERIALS AND METHODS

This study was carried out in wire green-house in the headquarters (1998/99) and at Maryout Research Station, Alexandria Governorate (1999/2000), Desert Research Center where the soil is sand clay loam, non-saline (Ec 4.83 ds/m), calcareous (27.73% CaCO3) and 0.81% organic matter. Seven parents of wide divergent origins of faba bean were used in the present study, i.e., Giza blanka (P1), Giza-717 (P2), Triple white (P3), Giza-643 (P4), Giza-461 (P5), Moshtohor-109 (P6) and Moshtohor-103 (P7). The last two lines produced from plant breeding program at Dept. Agron., Fac. Agric. Moshtohor, Zagazig Univ., Egypt (EL-Hosary, 1989).

In 1999/2000 season, two experiments were conducted, each experiment included the seven parents and their 21 F1 hybrids, which were sown in a randomized complete block design with three replications. The first experiment was normally irrigated every 45 days in addition to the rainfall. In the second experiment, dry method of sowing was used and one supplemental irrigation at sowing was added, then after, plants were left to grow under rainfall conditions. The amount of rainfall was 132 mm along the growing season.

The obtained data for each trait were analyzed on individual plant mean basis. An ordinary analysis of variance was firstly performed according to Snedecor and Cochran (1967).

Heterosis was also determined according to Paschal and Wilcox (1975) for individual crosses as the percentage deviation of F_1 mean performance from the better parent mean (BP) for each experiment as well as the combined analysis as follows:

The better parent heterosis = $[(\overline{F_1}-\overline{BP}) / \overline{BP}]\times 100$

General and specific combining ability estimates were obtained by employing Griffing's (1956) diallel cross analysis designated as model–1 method-2 from each experiment and over both experiments.

RESULTS AND DISCUSSION

The analysis of variance for each of the two environments (irrigated and rain-fed) as well as the combined data for yield and yield components is presented in table (1). Environments mean squares were significant for all the studied traits.

Significant genotype mean squares were obtained for all traits in both experiments as well as the combined data. This indicates the wide diversity between the parental materials used in the present study. Significant genotype x environment mean squares were obtained for all studied traits, revealing that the performance of genotypes differed from one environment to another.

Results also showed that mean squares due to parents were significant for all the studied traits. Significant mean squares due to interaction between parents and environments were detected for all the studied traits except for number of seeds/plant and 100-seed weight, indicating that the parents varied in their response to environment in these traits.

The mean performances of seven parental varieties and/or lines of faba bean at separate experiments as well as the combined data are presented in table (2). The variety Giza blanka gave the highest values for seed yield, number of seeds/plant, and 100-seed weight in both environments as well as the combined analysis. Meanwhile, it had moderate values for number of pods/plant. Also, the variety Giza-717 ranked the second for 100-seed weight and seed yield/plant while it was moderate for the other traits. The variety Triple white gave moderate values for most traits. The variety Giza-643 ranked the second over the tested parents for number of seeds/plant, especially under normal irrigation it ranked the third for seed yield/plant and it was moderate for other traits. The parents Giza-461, Moshtohor-109, and Moshtohor-103 gave moderate to low values for all the studies traits.

For number of pods/plant, the cross Triple white x Giza-461 showed significant higher mean values in both environments as well as in the combined data followed by cross Giza-blanka x Moshtohor-109 under normal irrigation and cross Giza-717 x Triple white under both rainfall and the combined data. While, the crosses Giza-717 x Moshtohor-109 , Giza-717 x Moshtohor-103 , Triple white x Moshtohor-103 , Giza-643 x Moshtohor-109 , Giza-461 x Moshtohor-109 and Giza-461 x Moshtohor-103 gave the lowest number of pods/plant in the combined data.

The two crosses Giza-blanka x Triple white and Giza-blanka x Giza-717 under normal irrigation, two crosses Giza-blanka x Giza-461 and Giza-blanka x Giza-717 under both rain-fed and the combined data gave the highest number of seeds/plant. However the cross Giza-461 x Moshtohor-109 was the lowest one in this respect.

Regarding seed yield/plant, the two crosses Giza-blanka x Triple white and Giza-blanka x Giza-717 under normal irrigation, the cross Giza-blanka x Giza-461 under rainfed, and the two crosses Giza-blanka x Giza-461 and Giza-blanka x Triple white in the combined data showed significant higher mean values compared with other crosses. Therefore, the crosses involving Giza blanka exhibited higher seed yield/plant. Generally, the four crosses Giza-blanka x Giza-717, Giza-blanka x Giza-461, Giza-blanka x Triple white, and Giza-717 x Moshtohor-103, four crosses, Giza-blanka x Giza-461, Giza-717 x Triple white, Giza-717 x Moshtohor-109 and Triple white x Moshtohor-109 and four crosses; Giza-blanka x Triple white, Giza-blanka x Giza-717, Giza-blanka x Giza-461, and Giza-717 x Moshtohor-103 gave the highest seed yield/plant under normal irrigation, rainfall and the combined data, respectively. The high seed yield/plant of the previous crosses could be attributed to high values of one or more of yield components.

Mean squares for parent vs. crosses as an indication to average heterosis overall crosses was of appreciable magnitude in both environments (normal irrigation and rain-fed) as well as in their combined for all traits (Table 1). Significant interaction between parents vs. crosses and environments was detected for number of pods/plant, indicating that the heterotic effects were affected by the environmental changes for such trait.

Heterosis expressed as the percentage deviation of F_1 mean performance from better parent average values for all traits studied at both environments and an average over the two environments, are presented in table (3).

With respect to number of pods per plant, eight, six and eight crosses had significant positive heterotic effects relative to better parent in the irrigated and rain-fed as well as in the combined analysis, respectively. However, the crosses; Triple white x Giza-461, Giza-717 x Triple white, Giza blanka x Giza-717 and Giza blanka x Giza-461 exhibited significant positive heterotic effect relative to better parents, and these were true in irrigated, rain-fed condition and over both environments. Significant positive heterotic effects for number of pods per plant over the better parents were recorded by EL-Hosary (1983), Abd EL- Raheem and Ismail (1986), EL-Hosary (1988), Abul-Naas *et al.,* (1991), Abo EL-Zahab *et al.,* (1994a) and Helal (1997).

For number of seeds/plant, six, three and seven crosses had significant positive heterotic effects relative to better parent in the normal and rainfall irrigations as well as in the combined data, respectively. However, the crosses; Giza blanka x Giza-461 and Giza-717 x Triple white had significant positive heterosis relative to better parents in the two environments and their combined data. Significant positive heterotic effects for number of seeds/plant were recorded by EL-Hosary (1983), Abd EL-Raheem and Ismail (1986), Abo EL-Zahab *et al.,* (1994a) and Helal (1997).

TABLE (1). Mean squares from ordinary analysis and combining ability for all the studied traits from the F_1 generation under irrigated and rain-fed conditions as well as over both environments.

S.O.V.	d.f.		No. of pods/plant			No. of seeds/plant			Seed yield/plant (g)			100-seed weight (g)		
	Single	Comb.	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.
Reps. In Env.	2	4	3.63	7.74	5.68	31.88	133.18	82.53	49.10	4.95	27.02	10.81	7.53	9.17
Environments		1			20763.5**			79826.2**			59658.8**			247373.2**
Genotypes(G)	27	27	162.91**	100.60**	223.85**	844.13**	343.91**	935.22**	703.43**	190.63**	591.52**	192.50**	199.10**	337.53**
Parents(P)	6	6	140.55**	28.79**	135.08**	332.79**	188.17*	446.95**	307.01**	126.81**	330.90**	290.37**	398.69**	662.81**
Crosses (C)	20	20	138.47**	114.05**	212.76**	962.23**	355.12**	999.45**	842.06**	193.79**	658.91**	121.36**	109.96**	166.63**
P x C.	1	1	785.80**	262.30**	978.08**	1550.2**	1054.13**	2580.4**	309.37**	510.31**	807.11**	1028.05**	784.42**	1803.91**
G × Env.		27			39.65**			252.81**			302.56**			54.07**
P × Env.		6			43.27*			74.02			102.92**			26.26
C × Env.		20			39.74**			317.89**			376.93**			64.69**
P. vs C. × Env.		1			70.03*			23.93			12.57			8.56
Error	54	108	16.90	7.51	12.21	35.01	68.22	51.61	23.49	10.48	16.98	19.19	20.98	20.08
G.C.A.		6	53.20*	27.87*	29.44*	569.19**	220.92**	349.48**	438.18**	113.03**	219.93**	62.88**	95.44**	75.71**
S.C.A.		21	54.61**	35.14**	39.56**	199.15**	84.27**	100.56**	176.28**	49.41**	63.92**	64.53**	58.08**	50.69**
G.C.A. × Env.		6			51.64**			440.63**			331.27**			82.62**
S. C.A. × Env.		21			50.21**			182.86**			161.77**			71.89**
Error term	54	108	5.63	2.50	4.06	11.67	22.74	17.20	7.83	3.49	5.66	6.39	6.99	6.69
G.C.A/S.C.A			0.97	0.79	0.74	2.86	2.62	3.48	2.49	2.29	3.44	0.97	1.64	1.49
G.C.A. × Env. / G.C.A.					1.75			1.26			1.51			1.09
S.C.A. × Env. / S.C.A.					1.27			1.82			2.53			1.42

* and ** indicates significant at 0.05 and 0.01 levels of probability, respectively.

Comb.= Combined

G.C.A.= General Combining Ability

S.C.A. = Specific Combining Ability

TABLE (2). Genotypes mean performance for the studied traits under irrigated and rainfed conditions as well as over both environments.

Genotypes	No. of pods/plant			No. of seeds/plant		
	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.
Giza blanka (P_1)	20.533	14.967	17.75	59.933	39.833	49.880
Giza-717 (P_2)	9.867	7.767	8.82	44.600	32.533	38.570
Tripe-white. (P_3)	20.467	15.867	18.17	31.167	18.233	24.700
Giza-643 (P_4)	26.400	13.767	20.08	59.900	28.600	44.250
Giza-461 (P_5)	23.800	13.967	18.88	43.233	27.867	35.550
Moshtohor-109 (P_6)	32.167	17.333	24.75	41.700	17.100	29.400
Moshtohor-103 (P_7)	20.133	15.867	18.00	40.500	25.300	32.900
$P_1 \times P_2$	30.400	19.233	24.82	96.933	51.267	74.100
$P_1 \times P_3$	32.333	12.833	22.58	97.000	38.833	67.920
$P_1 \times P_4$	28.067	14.100	21.08	48.500	38.600	43.550
$P_1 \times P_5$	30.867	23.267	27.07	77.100	65.667	71.380
$P_1 \times P_6$	42.933	16.700	29.82	61.167	23.333	42.250
$P_1 \times P_7$	28.833	20.433	24.63	62.933	39.833	51.380
$P_2 \times P_3$	38.600	31.733	35.17	54.933	45.733	50.330
$P_2 \times P_4$	27.167	15.700	21.43	53.400	31.467	42.430
$P_2 \times P_5$	25.233	16.833	21.03	51.933	40.267	46.100
$P_2 \times P_6$	20.433	15.767	18.10	53.667	42.433	48.050
$P_2 \times P_7$	18.933	16.133	17.53	73.633	36.533	55.080
$P_3 \times P_4$	27.367	20.800	24.08	44.267	24.767	34.520
$P_3 \times P_5$	47.333	38.033	42.68	43.100	33.133	38.120
$P_3 \times P_6$	25.767	16.467	21.12	40.467	29.200	34.830
$P_3 \times P_7$	25.200	15.233	20.22	58.167	31.133	44.650
$P_4 \times P_5$	26.633	16.200	21.42	36.900	30.833	33.870
$P_4 \times P_6$	24.800	12.967	18.88	46.967	35.833	41.400
$P_4 \times P_7$	30.833	14.500	22.67	55.333	18.233	36.780
$P_5 \times P_6$	26.233	14.033	20.13	26.533	17.867	22.200
$P_5 \times P_7$	24.600	16.200	20.40	44.933	31.467	38.200
$P_6 \times P_7$	25.867	17.133	21.50	43.567	33.767	38.670
$\bar{x}$ Overall parents	21.910	14.219	18.064	45.862	27.067	36.464
$\bar{x}$ Overall F_1's	28.973	18.300	23.636	55.783	35.248	45.515
$\bar{x}$ Overall genotypes	27.207	17.280	22.243	53.302	33.202	43.252
L.S.D. $_{0.05}$	3.08	2.52	2.84	3.70	4.37	4.07
L.S.D. $_{0.01}$	3.55	2.90	3.28	4.26	5.04	4.70

TABLE (2). Cont.

Genotypes	Seed yield (g/plant)			100-seed weight		
	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.
Giza blanka (P1)	65.586	40.178	52.882	109.433	100.867	105.15
Giza-717 (P2)	43.262	30.538	36.900	97.000	93.867	95.43
Tripe-white. (P3)	27.344	13.474	20.409	87.733	73.900	80.82
Giza-643 (P4)	48.140	20.335	34.238	80.367	71.100	75.73
Giza-461 (P5)	35.754	21.448	28.601	82.700	76.967	79.83
Moshtohor-109 (P6)	36.529	12.432	24.481	87.600	72.700	80.15
Moshtohor-103 (P7)	36.342	19.995	28.169	89.733	79.033	84.38
P1 × P2	81.489	31.639	56.714	84.067	62.300	73.18
P1 × P3	84.292	29.190	56.741	86.900	75.167	81.03
P1 × P4	38.978	28.783	33.881	80.367	74.567	77.47
P1 × P5	64.430	50.548	57.486	83.567	76.967	80.27
P1 × P6	39.881	14.700	27.291	65.200	63.000	64.10
P1 × P7	50.514	28.879	39.70	80.267	72.500	76.38
P2 × P3	47.389	35.123	41.256	86.267	76.800	81.53
P2 × P4	44.785	25.415	35.100	83.867	80.767	82.32
P2 × P5	49.371	30.576	39.974	95.067	75.933	85.50
P2 × P6	43.739	33.649	38.694	81.500	79.300	80.40
P2 × P7	65.092	31.699	48.396	88.400	86.767	87.58
P3 × P4	36.225	17.857	27.041	81.833	72.100	76.96
P3 × P5	34.580	25.126	29.854	80.233	75.833	78.03
P3 × P6	33.938	32.893	28.416	83.867	78.400	81.13
P3 × P7	45.738	22.115	33.927	78.633	71.033	74.83
P4 × P5	31.894	24.040	27.967	86.433	77.967	82.20
P4 × P6	39.311	28.344	33.828	83.700	79.100	81.40
P4 × P7	41.610	12.508	27.059	75.200	68.600	71.90
P5 × P6	21.049	13.638	17.344	79.333	76.333	77.83
P5 × P7	34.089	20.915	27.502	75.867	66.467	71.17
P6 × P7	40.735	22.691	31.713	93.500	67.200	80.35
$\bar{x}$ Overall parents	41.851	22.629	32.240	90.652	81.205	85.93
$\bar{x}$ Overall F1's	46.149	26.220	36.185	82.575	74.148	78.36
$\bar{x}$ Overall genotypes	45.075	25.322	35.199	84.595	75.912	80.25
L.S.D. 0.05	3.34	2.73	3.08	3.18	3.25	3.21
L.S.D. 0.01	3.86	3.15	3.56	3.67	3.75	3.71

Comb. = Combined

TABLE (3). Percentage of heterosis in the F_1 generation over better parent for the studied traits under irrigated and rainfed conditions as well as over both environments.

Crosses	No. of pods/plant			No. of seeds/plant		
	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.
Giza blanka × Giza-717	48.05**	28.51**	39.81**	61.74**	28.70	48.56**
Giza blanka × Tripe-white	57.47**	-19.12	24.31*	61.85**	-2.51	36.17**
Giza blanka × Giza-643	6.31	-5.79	4.98	-19.08*	-3.09	-12.69
Giza blanka × Giza-461	29.69*	55.46**	43.34**	28.64**	64.86**	43.10**
Giza blanka × Moshtohor-109	33.47**	-3.65	20.47*	2.06	-41.42*	-15.30
Giza blanka × Moshtohor-103	40.42*	28.78*	36.85**	5.01	0.000	3.01
Giza-717 × Tripe-white	88.60**	100.00**	93.58**	23.17*	40.57*	30.49**
Giza-717 × Giza-643	2.90	14.04	6.72	-10.85	-3.28	-4.11
Giza-717 × Giza-461	6.02	20.53	11.39	16.44	23.77	19.52
Giza-717 × Moshtohor-109	-36.48**	-9.04	-26.9**	20.33	30.43	24.58*
Giza-717 × Moshtohor-103	-5.96	1.68	-2.59	65.10**	12.30	42.81**
Tripe-white × Giza-643	3.66	31.09**	-19.92*	-26.10**	-13.40	-21.99*
Tripe-white × Giza-461	98.88**	139.70**	126.0**	-0.31	18.90	7.33
Tripe-white × Moshtohor-109	-19.90	-4.99	-14.68	-2.96	60.15*	18.47
Tripe-white × Moshtohor-103	23.13	-3.99	11.28	43.62**	23.06	35.71**
Giza-643 × Giza-461	0.88	15.99	6.64	-38.40**	7.81	-23.46*
Giza-643 × Moshtohor-109	-22.90*	-25.19	-23.7**	-21.59*	25.29	-6.44
Giza-643 × Moshtohor-103	16.79**	-8.61	12.86*	-7.62	-36.25	-16.88
Giza-461 × Moshtohor-109	-18.45	-19.04	-18.65*	-38.63**	-35.88	-37.55**
Giza-461 × Moshtohor-103	3.36	2.10	8.03	3.93	12.92	7.45
Moshtohor. 109 × Moshtohor-103	-19.59	-1.15		4.48	33.47	17.54
Crosses	Seed yield (g/plant)			100-seed weight		
	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.
Giza blanka × Giza-717	24.25**	-20.51**	7.25	-23.18**	-38.24**	-30.40**
Giza blanka × Tripe-white	28.52**	-27.35**	7.30	-20.59**	-25.48**	-22.94**
Giza blanka × Giza-643	-40.57**	-28.63**	-35.93**	-26.56**	-26.07**	-26.32**
Giza blanka × Giza-461	-1.76	25.80**	8.71	-23.64**	-23.70**	-23.66**
Giza blanka × Moshtohor-109	-39.19**	-63.41**	-48.39**	-40.42**	-37.54**	-39.04**
Giza blanka × Moshtohor-103	-22.98**	-28.12**	-24.93**	-26.65**	-28.12**	-27.36**
Giza-717 × Tripe-white	9.54	15.01	11.80	-11.07**	-18.18**	-14.57**
Giza-717 × Giza-643	-6.97	-16.78	-4.88	-13.54**	-13.96**	-13.74**
Giza-717 × Giza-461	14.12	0.12	8.33	-1.99	-19.11**	-10.41**
Giza-717 × Moshtohor-109	1.10	10.19	4.86	-15.98**	-15.52**	-15.75**
Giza-717 × Moshtohor-103	50.46**	3.81	31.15**	-8.87*	-7.56	-8.23**
Tripe-white × Giza-643	-24.75**	-12.19	-21.02**	-6.73	-2.44	-4.76
Tripe-white × Giza-461	-3.284	17.15	4.38	-8.55*	-1.47	-3.45
Tripe-white × Moshtohor-109	-7.09	69.91**	16.07	-4.41	6.09	0.38
Tripe-white × Moshtohor-103	25.85*	10.60	20.44*	-12.37**	-10.12*	-11.32**
Giza-643 × Giza-461	-33.75**	12.09	-18.32**	4.51	1.30	2.97
Giza-643 × Moshtohor-109	-18.34*	39.39**	-1.20	-4.45	8.80	1.56
Giza-643 × Moshtohor-103	-13.57	-38.49**	-20.97**	-16.20**	-13.20**	-14.79**
Giza-461 × Moshtohor-109	-42.38**	-36.41**	-39.36**	-9.44*	-0.82	-2.90
Giza-461 × Moshtohor-103	-6.20	-2.49	-3.84	-15.45**	-15.90**	-15.66**
Moshtohor. 109 × Moshtohor-103	11.51	13.48	12.58	4.20	-14.97**	-4.78

* and ** indicates significant at 0.05 and 0.01 levels of probability, respectively.
Comb. = Combined

TABLE (4). Estimates of general combining ability effects for parental varieties/or lines regarding studied traits in the F_1 generation.

Parental Variety or line	No. of pods/plant			No. of seeds/plant			Seed yield/plant (g)			100-seed weight (g)		
	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.	Irrigation	Rainfed	Comb.
Giza blanka	1.87*	-0.19	0.84	15.23**	7.95**	11.59**	12.53**	4.29**	8.41**	-2.35*	-4.16**	-3.25**
Giza-717	-4.13**	-0.81	-2.47*	5.25**	5.24*	5.25**	6.18**	5.41**	5.79**	4.05**	4.70**	4.37**
Tripe-white.	2.21*	3.18**	2.69**	-7.85**	-5.44*	-6.65**	-4.78**	-1.70*	-3.24**	3.25**	4.20**	3.72**
Giza-643	0.01	-1.83*	-0.91	-2.36*	-3.19*	-2.77*	-2.99*	-2.82**	-2.90*	-2.74*	-1.33	-2.03*
Giza-461	1.20	1.58*	1.39*	-6.61**	1.04	-2.78*	-7.52**	0.57	-3.48**	-1.21	-0.41	-0.82
Moshtohor. 109	1.41	-1.17*	0.12	-2.91*	-2.93	-2.92*	-0.56	-2.80**	-1.68*	-0.39	-1.13	-0.76
Moshtohor .103	-2.57*	-0.76	-1.67*	-0.76	-2.67	-1.72	-2.86*	-2.95**	-2.90*	-0.60	-1.85*	-1.23
L.S.D. 0.05 $\hat{g}_i$	1.47	0.98	1.23	2.12	2.96	2.54	1.73	1.16	1.46	1.57	1.64	1.58
L.S.D. 0.01	1.96	1.31	1.63	2.82	3.94	3.36	2.31	1.54	1.93	2.09	2.19	2.10
r	0.654	0.179	0.448	0.644	0.884**	0.783*	0.817*	0.846*	0.860*	0.075	-0.107	-0.044

* and ** indicates significant at 0.05 and 0.01 levels of probability, respectively.
Comb. = Combined
r = Correlation Coefficient between the parental performance and their G.C.A. effects.

For-100 seed weight, none of the crosses exceeded better parent values. Positive heterosis for 100-seed weight was reached before by Bond (1966), EL-Hosary (1983 and 1984), Abd EL-Raheem and Ismail (1986), EL-Hosary (1987a and 1988), Helal (1997) and Omar *et al.,* (1998).

Concerning seed yield/plant of all combination crosses, four, four and two crosses exhibited significant positive heterotic effects relative to better parent in the irrigated rainfed as well as in the combined data, respectively. In the combined data the two crosses Giza-717 x Moshtohor-103 and Triple white x Moshtohor-103 showed desirable heterotic effects relative to better parent with greatest advantage being 25.8%.

The components of yield for individual crosses also showed in most cases, less heterosis than yield itself. Also, the heterotic effects were lower in rainfall irrigation than those of normal one. Many investigators reported high heterosis for seed yield of faba bean (EL-Hosary 1983, 1984, 1985, 1987a and 1988); EL-Hosary and Sedhom, 1988; Hendawy *et al.,* 1988; Abul-Naas *et al.,* 1991; EL-Hosary *et al.*,1992; Abd-El-Aziz, 1993 and EL-Hosary *et al.,* l997).

Analysis of variance for combining ability as outlined by Griffing's (1956) model-1 method-2 in each experiment and their combined data for all the studied traits is presented in table (1). The mean squares associated with general combining ability (G.C.A.) and specific combining ability (S.C.A.) were significant for all the studied traits .It is evident that both additive and non-additive gene effects were involved in determining the performance of single cross progeny. Also, when G.C.A./S.C.A. ratio was calculated, it was found that all traits except number of pods per plant in both environments as well as the combined data and 100-seed weight under irrigation experiment exhibited G.C.A./S.C.A. ratio exceeded the unity, indicating the predominance of additive and additive × additive types of gene action in the inheritance of such traits.

For the exceptional case of number of pods/plant under rainfed and the combined data, low G.C.A./S.C.A. ratio which less than unity was detected. Such results indicate that non-additive type of gene action was more important than additive one in controlling this trait. The magnitude of additive and non–additive types of gene action were similar for number of pods/plant and 100-seed weight under irrigation experiment. The genetic variance was previously reported to be mostly due to additive type of gene action for yield and yield components by El-Hosary (1983, 1984 and 1985), Abd El-Raheem and Ismial (1986), El-Hosary (1987a and b, and 1988), Hendawy *et al*. (1988), Abul-Naas *et al*. (1989 and 1991), Dawwam (1991), El-Hosary *et al*. (1992), Abd EL-Aziz (1993), Abo El-Zahab *et al.* (1994 b), Kaul and Vaid (1996), Helal (1997), El-Hady *et al*. (1998), Omar *et al*. (1998) and El-Refaey *et al.* (1999).

The mean squares of interaction between irrigation treatments and both types of combining ability were significant for all traits. Such results

show that the magnitude of all types of gene action varied from one environment to another. It is fairly evident that the ratios of S.C.A × Env./S.C.A. was higher than the ratios of G.C.A. × Env./G.C.A. for all traits except number of pods/plant. Such results indicate that non- additive gene effects were much more influenced by the irrigation treatments than the additive gene effects . Specific combining ability was stated by several investigator to be more sensitive to environmental changes than G.C.A. (Gilbert, 1958).

General Combining Ability Effects

Estimates of G.C.A. effects ($\hat{g}_i$) for individual parents in each trait in normal irrigation and rainfed as well as in the combined data are presented in table (4). General combining ability effects computed herein were found to be differ significantly from zero in all traits. High positive values would be of interest for all traits in question where high positive effects would be useful from the breeder's point of view.

The parental variety Triple white in both environments as well as the combined data, Giza-461 under rainfall and the combined data, and Giza blanka under normal irrigation had significantly positive $\hat{g}_i$ for number of pods/plant and proved to be good combiners in this respect.

The two parents Giza-717 and Triple white could be considered as excellent parents in breeding program towards releasing varieties characterized by high seed index. The other parents exhibited either significant negative or insignificant $\hat{g}_i$ for this trait.

For seed yield and number of seeds/plant, the two parents Giza blanka and Giza-717 seemed to be good combiners.

Concerning seed yield/plant and its components, it is worth- noting that the parent which possessed high $\hat{g}_i$ for seed yield might be also so in one or more of yield components. On the other hand, the parent which posses high $\hat{g}_i$ for one or more of yield components may not necessarily have high general combining ability effect for seed yield itself. $\hat{g}_i$ for seed yield/plant was largely manifested in parents showing high $\hat{g}_i$ for number of seeds/plant.

Significant correlation coefficient values between the parental performance ($\bar{x}$) and its hybrids were obtained for number of seeds per plant in rainfall and the combined analysis, seed yield/plant in both environments as well as the combined data (Table 4). This finding indicates that the parental material gave good index of interspecific performance of their general combining ability effects. Therefore, selection among the tested parental population for initiating any proposed breeding program could be practiced either on the basis of mean performance or ($\hat{g}_i$) with similar efficiency.

For the rest cases, insignificant correlation coefficient values were detected between the two variables. This disagreement reveale that hybrids characterized with high mean values could be expected by crossing between varieties of low performance for these cases. A rather good agreement between ranking of parental performance and their G.C.A. effects was reported by EL-Hosary and Sedhom (1988) and Abul-Naas *et al.* (1989).

Specific combining ability effects of the parental combinations were computed in separate environments as well as over environments (Table 5).

The three crosses Triple white x Giza-461, Giza-717 x Triple white and Giza blanka x Giza-717 had significant positive $\hat{S}_{ij}$ for number of pods/plant under the two environments and over both environments.

Considering 100-seed weight, four, two and three crosses combinations showed significant positive $\hat{S}_{ij}$ under irrigated, rain-fed and the combined data, respectively. The cross Giza-717 x Giza-461 under irrigated and cross Giza-717 x Moshtohor-103 under rain-fed and the combined data gave the highest positive values of $\hat{S}_{ij}$ for this trait

Regarding seed yield/plant, five, seven and seven crosses showed significantly positive $\hat{S}_{ij}$ under normal irrigation, rainfall and the combined analysis, respectively. The best combinations were Giza blanka x Giza-461 and Giza-717 x Moshtohor-103 under both irrigation conditions and the combined data. Also, the crosses Giza blanka x Giza-717 under normal irrigation, and Giza-717 x Triple white and Triple white x Giza-643 under rain-fed showed the best $\hat{S}_{ij}$. It could be concluded that the previous crosses seemed to be the best combinations for drought tolerance where it gave significant $\hat{S}_{ij}$ for seed yield/plant as well as most of the yield components under rain-fed conditions.

For all traits the values of $\hat{S}_{ij}$ effects were differed from one environment to another. This finding coincide with that reached before (Table1).

If crosses showing high specific combining ability effects involving only one good combiner, such combinations would show with desirable transgressive segregates, providing that the additive genetic system present in the good combiner as well as the complementary and epistatic effects present in the crosses, act in the same direction to reduce undesirable plant characteristics and maximize the character in view. Therefore, the most of the previous crosses might be of prime importance in breeding to drought tolerant varieties by using traditional breeding procedures.

TABLE (5). Estimates of specific combining ability effects for F_1 crosses regarding studied traits.

Crosses	No. of pods/plant			No. of seeds/plant		
	Irrigation	Rainfall	Comb.	Irrigation	Rainfall	Comb.
Giza blanka × Giza-717	5.45**	2.96*	4.20**	23.15**	4.87	14.01*
Giza blanka × Tripe-white	1.05	-7.43**	-3.19	0.48	-12.38**	-5.95
Giza blanka × Giza-643	-1.01	-1.16	-1.09	-17.67**	0.63	-
Giza blanka × Giza-461	0.58	4.60**	2.59	15.17**	23.47**	19.32*
Giza blanka × Moshtohor-109	12.44**	0.78	6.61**	31.37**	0.61	15.99*
Giza blanka × Moshtohor-103	2.32	4.11	3.22	-4.84	1.35	-1.74
Giza-717 × Tripe-white	13.31**	12.09**	12.70**	2.96	9.44*	6.19
Giza-717 × Giza-643	4.09	1.06	2.57	-2.79	-3.79	-3.29
Giza-717 × Giza-461	0.95	-1.22	-0.14	-0.02	0.79	0.39
Giza-717 × Moshtohor-109	-4.06	0.47	-1.79	-0.72	10.22**	4.75
Giza-717 × Moshtohor-103	-1.58	0.43	-0.57	15.84**	0.77	8.30*
Tripe-white × Giza-643	-2.05	2.17	0.06	3.88	11.26**	7.57*
Tripe-white × Giza-461	16.71**	15.99**	16.35**	-12.31**	-10.93**	-
Tripe-white × Moshtohor-109	-5.06**	-2.82	-3.94*	-2.08	4.37	1.14
Tripe-white × Moshtohor-103	-1.64	-4.46**	-3.05	-1.12	8.68*	3.78
Giza-643 × Giza-461	-1.78	-0.84	-1.31	-7.44**	-0.22	-3.83
Giza-643 × Moshtohor-109	-3.82	-1.32	-2.57	-3.77	-2.32	-3.04
Giza-643 × Moshtohor-103	6.19**	-0.19	3.00	5.15	-9.11*	-1.98
Giza-461 × Moshtohor-109	-3.59	-3.66**	-3.63*	-0.69	1.82	0.57
Giza-461 × Moshtohor-103	-1.24	-1.90	-1.57	-1.00	-0.10	-0.55
Moshtohor. 109 × Moshtohor-103	-0.18	1.78	0.80	8.53**	3.53	6.03
L.S.D 0.05	4.28	2.85	3.58	6.16	8.59	7.38
(S_{ij}) 0.01	5.71	3.80	4.75	8.21	11.46	9.77
Giza blanka × Giza-717	25.09**	-5.33**	9.88**	-2.22	-14.16**	-8.19**
Giza blanka × Tripe-white	-8.14**	-6.12**	-7.13**	-20.29**	-12.95**	-
Giza blanka × Giza-643	-18.29**	1.63	-8.33**	0.86	4.14	2.50
Giza blanka × Giza-461	6.95**	17.99**	12.47**	2.53	5.64**	4.09
Giza blanka × Moshtohor-109	31.75**	1.18	16.46**	5.06*	4.54	4.79*
Giza blanka × Moshtohor-103	-8.08**	1.75	-3.17	-1.37	2.59	0.61
Giza-717 × Tripe-white	-1.89	7.76**	2.94	-10.39**	-5.51**	-7.95**
Giza-717 × Giza-643	-5.59*	-4.45**	-5.02**	-2.04	1.49	-0.28
Giza-717 × Giza-461	-9.39**	-2.43	-5.91**	7.63**	-4.25	1.69
Giza-717 × Moshtohor-109	0.23	8.69**	4.46*	-1.98	2.68	-2.33
Giza-717 × Moshtohor-103	17.32**	5.81**	11.56**	0.36	8.01**	4.81*
Tripe-white × Giza-643	1.84	9.39**	5.62**	-1.41	0.32	-0.54
Tripe-white × Giza-461	-3.69	-7.07**	-5.38**	-7.30**	-3.35	-5.32**
Tripe-white × Moshtohor-109	-5.10*	4.12**	-0.49	-3.58	-0.58	-2.08
Tripe-white × Moshtohor-103	-5.65*	2.69	-1.48	6.26**	-11.06**	-2.39
Giza-643 × Giza-461	-2.01	5.04**	1.52	5.78**	3.82	4.79*
Giza-643 × Moshtohor-109	-1.89	-3.05	-2.47	0.37	-1.35	-0.49
Giza-643 × Moshtohor-103	3.95	-7.96**	-2.01	-6.06**	-4.13	-5.09*
Giza-461 × Moshtohor-109	-2.78	1.33	-0.72	-2.76	1.48	-0.64
Giza-461 × Moshtohor-103	0.44	-2.98	-1.27	-6.92**	-7.17**	-7.04**
Moshtohor. 109 × Moshtohor-103	8.22**	1.88	5.05**	-4.96*	-1.89	-3.43
L.S.D 0.05	5.04	3.37	4.23	4.56	4.77	4.60
(S_{ij}) 0.01	6.73	4.49	5.61	6.08	6.36	6.09

* and ** indicates significant at 0.05 and 0.01 levels of probability, respectively.
Comb. = Combined

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التلجينات التبادلية لتحديد الفجل البلدي تحت الزراعة المطرية
- المحصول ومكوناته

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أجريت هذه الدراسة بهدف دراسة مكونات التباين الوراثى وقوة الهجين لصفات المحصول ومكوناته حيث إستخدم لهذا الغرض سبعة آباء مختلفة وراثيا وهى جيزة بلانكا ، جيزة ēčē ، Triple white ، جيزة ĒĐď ، جيزة ĐĒč ، مشتهر čČě ، مشتهر ďČč

وقد أجرى هذا البحث خلال موسمى ČČČČ/ěě ، čěěě/ěĚ حيث تم عمل جميع الهجن الممكنة بين الآباء السبعة بنظام Half diallel cross فى الموسم الأول، وفى الموسم التالى أقيمت تجربتين مصممتين فى قطاعات كاملة العشوائية ذات ثلاثة مكررات بغرض تقييم الآباء والهجن الناتجة منها ، تم رى التجربتين بعد الزراعة فى ČČ نوفمبر ěěě أم رى التجربة الأولى بعد Đđ يوم و تركت التجربة الثانية للنمو تحت ظروف الأمطار السائدة بمنطقة مريوط التابعة لمحافظة الأسكندرية.

أهم النتائج المتحصل عليها ما يلى :

كان التباين الراجع لبيئتى الرى (العادى والمطرى) معنويا لكافة الصفات تحت الدراسة مع زيادة قيمة المتوسطات تحت ظروف الرى المعتاد عن الزراعة المطرية. أعطى الصنف جيزة بلانكا أعلى قيم لمتوسطات محصول البذرة بالنبات وعدد البذور وعدد الأفرع بالنبات ودليل البذرة فى كل من البيئتين وأيضا التحليل المشترك. كان تباين الهجن معنويا لكل الصفات المدروسة مما يشير الى زيادة درجة الاختلاف بينها. تفوقت سبعة وتسعة وإثنى عشر هجيناً تفوقاً معنوياً بالنسبة لقوة الهجين مقارنة بمتوسط الأبوين لصفة محصول البذرة بالنبات وذلك تحت تأثير ظروف الرى العادى والمطر وبيانات التحليل المشترك بينهما على التوالى. كما أظهرت أربعة وثلاثة وإثنين من الهجن معنوية موجبة لقوة الهجن عند مقارنتها بالأب الأفضل لنفس الصفة والنمو فى البيئات الثابتة على التوالى. ومن بيانات التحليل المشترك أظهر هجينين هما جيزة ēčē × مشتهر ďČč، Triple white × مشتهر ďČč قوة هجين عالية بالنسبة للأب الأفضل مع أفضلية بنسبة Đđ,Ě%.

كان التباين الراجع الى القدرة العامة والخاصة على التآلف معنويا لكافة الصفات المدروسة. كانت نسبة تباين القدرة العامة على التآلف الى تباين القدرة الخاصة على التآلف ذات قيمة اعلى من الوحدة لكافة الصفات تحت الدراسة فيما عدا صفة عدد القرون بالنبات فى كلا البيئتين وكذلك التحليل المشترك بينهما وكذلك صفة وزن الـ ČČČ بذرة فى ظروف الرى العادى مما يدل على أن الجزء الأكبر من الاختلافات الوراثية المرتبطة بهذه الصفة كان راجعا الى فعل الجين من النوع المضيف. أظهرت الهجن جيزة بلانكا × جيزة ēčē ، جيزة ĐĒč × مشتهر ďČč قدرة عالية خاصة على الائتلاف بالنسبة للمحصول وبعض مكوناته وذلك فى كلا البيئتين والتحليل المشترك بينهما وتعتبر من الهجن المبشرة لمواصلة برنامج التربية لرفع إنتاجية محصول الفول البلدى تحت ظروف المطر فى الأراضى الصحراوية الجديدة.

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DIALLEL CROSSES ANALYSIS FOR IMPROVING FABA BEAN (*Vicia faba* L.) UNDER RAIN-FED CONDITIONS

2- STRESS SUSCEPTIBILITY INDEX (DROUGHT TOLERANCE)

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The present study was conducted during 1998/99 and 1999/2000 seasons to estimate the type and relative amount of genetic variance components and their interactions with experimental conditions for yield and yield components in faba bean. A half diallel set of crosses involving seven parental varieties namely, Giza blanka (P_1), Giza-717 (P_2), Triple white (P_3), Giza-643 (P_4), Giza-461 (P_5), Moshtohor-109 (P_6) and Moshtohor-103 (P_7) were utilized under two experimental conditions, the first was normally irrigated at once every 45 days in addition to the amount of rainfall, and the second, dry method of sowing was used with one supplemental irrigation at sowing, then plants were left to grow under rainfall conditions. The parents and their 21 F_1-crosses were evaluated in a randomized complete block design with three replications in Maryout Research Station, Alexandria Governorate. Data were recorded on individual plant mean basis and analyzed by the procedure developed by Griffing (1956) as model-1 method-2. The combined analysis was calculated for the two experimental conditions.

The obtained results could be summarized as follows:

Mean squares of genotypes parents, crosses and parents vs. crosses were highly significant for stress susceptibility index (SI) of yield and its components except parents vs. crosses for SI for number of pods/plant and 100-seed weight.

The mean squares associated with general and specific combining abilities were significant for SI of yield and the three yield components. Also, low general / specific-combining ability (G.C.A/S.C.A.) ratio of less than unity were detected for number of seeds/plant, seed yield/plant and 100-seed weight.

The parental cv. Giza-461 (P_5) seemed to be the best combiner for SI of number of seeds and seed yield/plant. At the

same direction, it gave significant negative value for SI of 100-seed weight. The parental cv. Triple white (P_3) expressed negative significance SI for number of pods/plant and 100-seed weight. While, the parental cv. Giza-643 (P_4) was highly tolerant for 100-seed weight. Therefore, the two parental cvs. Giza-717 (P_2) and Giza-461 (P_5) could be considered as excellent parents in breeding programs towards releasing tolerant variety for drought stress.

Keywords: faba bean, stress susceptibility index, drought, genotypes.

Breeding improved genotypes for the arid and semi-arid areas by selecting solely for seed yield is difficult because the amount and temporal distribution of available moisture varies from year to year. The genotypic yield variance is low under such conditions because plant character that influence performance have differing opportunities for expression in successive years. Plant breeders (Blum, 1983 and Rosenow *et al.*, 1983) and plant physiologists (Bidinger *et al.*, 1982 and Garrity *et al.*, 1982) believe that better-adapted and higher-yielding genotypes can be bred more efficiently and effectively if attributes that confer drought resistance could be identified and used as selection criteria. However, there are few examples where this approach has been used, and even fewer where it was successful (Passioura, 1981 and Richards, 1982).

Empirical selection for improved variety performance under drought conditions has occurred since early times as countless crops have been exposed to the region of drought. With the development of modern plant breeding concepts, the process has been progressively refined and countries with active hybridization using recognizable superior genotypes, followed by selection in a regime involving exposure to drought conditions. The genetical information on faba beans may help the breeder in designing suitable program to develop well-adapted cultivars to drought stress conditions.

The present study involved information on the genetic parameters for susceptibility index (SI) concerning four traits of yield and its components in faba bean crosses evaluated under different environmental stress conditions.

MATERIALS AND METHODS

This study was carried out in the wire green-house in the headquarters (1998/99) of Marout Research Station, Alexandria Governorate (1999/2000), Desert Research Center where the soil is sand clay loam, non saline (Ec 4.83 ds/m), calcareous (27.73% $CaCO_3$) and 0.81% organic matter during 1999/2000 growing season. Seven parents of wide divergent origins of faba

bean were used in the present study, i.e., Giza blanka (P_1), Giza-717 (P_2), Triple white (P_3), Giza-643 (P_4), Giza-461 (P_5), Moshtohor-109 (P_6) and Moshtohor-103 (P_7). The last two lines produced upon plant breeding program at Dept. Agron., Fac. Agric. Moshtohor, Zagazig Univ., Egypt (El Hosary and Sedhom, 1989).

A diallel crosses set involving the seven parents was made in winter season of 98/99 in wire cages under normal conditions of Desert Research Center, Matareya, Cairo.

In 1999/2000 season, two experiments were conducted, each experiment included the seven parents and their 21 F_1 hybrids, which were sown on 20th November, 1999 in a randomized complete blocks design R.C.B.D. with three replications. The two experiments were planted in two adjacent fields to avoid the differences in soil productivity. The first experiment was normally irrigated at once every 45 days in addition to rainfall. In the second experiment, dry method of sowing, was used with one supplemental irrigation at sowing, after which, plants were left to grow under rainfall conditions (stress environments). The amount of rainfall was 132 mm at the growing season. In both experiments, fertilization at the level of 100 kg P_2O_5/fed. was added before sowing. All other agricultural practices were carried out as usual in the conventional faba bean fields. In each experiment, the plot consisted of four ridge and each ridge was five-meter long and 60 cm width. Hills were spaced at 20 cm one seed hill on one side of the ridge.

The Studied Characters

In each experiment, data concerning the following traits were recorded on 10 individual plants chosen at random from each plot; number of pods per plant, number of seeds per plant, seed yield per plant (g) and 100-seed weight (g). The data obtained for each traits was analyzed on individual plant mean basis. An ordinary analysis of variance for R.C.B.D. was performed according to Snedecor and Cochran (1967). Heterosis was also determined according to Paschal and Wilcox (1975) for individual crosses as the percentage deviation of F_1 mean performance from the better parent mean (BP) for each experiment as well as the combined analysis as follows:

The better parent heterosis = $[(\overline{F_1}-\overline{BP}) / \overline{BP}]\times 100$

General and specific combining ability estimates were obtained by employing Griffing's (1956) diallel cross analysis designated as model-1 method-2.

Data of yield and its components were used to estimate the stress susceptibility index (SI). An SI was used to characterize relative stress tolerance of all genotype. The susceptibility index was calculated from normal irrigation (normal environment) and the stress environment (one supplemental irrigation at sowing and rainfall). SI was calculated according to Fischer and Maurer (1978) as follows:

$SI = [(1 - (y_{ij}/y_{ic}) / (1 - (y - j)/(y - c)]$

Where;

y_{ij} = Grain yield of the i^{th} genotype in the j^{th} drough treatment.

y_{ic} = Grain yield of the same genotype in the control treatment.

y-j = Mean grain yield over all genotypes in the j^{th} drought treatment.

y-c = Mean grain yield over all genotypes in the control treatment.

RESULTS AND DISCUSSION

Mean squares for SI of yield and some of yield components are presented in table (1). Mean squares of SI genotypes, parents, crosses and parents vs. crosses were highly significant for yield and its components except parent vs. crosses for number of pods/plant and 100-seed weight. Such results indicated the wide diversity between the parental materials used in this study.

TABLE (1).Observed mean squares from ordinary analysis and general and specific combining ability (G.C.A. and S.C.A.) of variance for stress susceptibility index (SI) of yield and yield components in F_1 generation and parents.

Source of variance	d.f	SI for No. of pods/plant	SI for No. of seeds/plant	SI for 100-seed weight	SI for seed/plant
Blocks	2	0.009	0.003	0.006	0.012
Genotypes	27	0.358**	0.515**	1.350**	0.632**
Parents (P)	6	0.271**	0.257**	0.773**	0.323
Crosses (C)	20	0.402**	0.606**	1.586**	0.709**
P.vs.c.	1	0.021	0.243**	0.100	0.952**
Error	54	0.033	0.021	0.036	0.027
G.C.A.	6	0.228**	0.132**	0.224**	0.198**
S.C.A.	21	0.089**	0.183**	0.515**	0.215**
Error term	54	0.011	0.007	0.012	0.009
G.C.A./ S.C.A.		2.562	0.721	0.440	0.921

** indicate significant at 0.01 level of probability.

Mean performance of the seven parents of faba bean and its combination crosses for SI are presented in table (2). The susceptibility index was used to estimate relative stress injury because it accounted for variation in yield potential and stress intensity. Low stress susceptibility (S < 1) is synonymous with higher stress tolerance (Fischer and Maurer, 1978).

Application of SI for yield and some yield components based on the data over both environments the parents; Giza- 717 (P_2) and Giza blanka (P_1) gave the desirable SI for yield and its three components, followed by Giza-461 (P_5) for seed yield/plant, 100-seed weight and number of seed/plant. The parental variety Triple white (P_3) expressed the desirable SI for number of pods/plant, and Moshtohor- 103 (P_7) for number of pods/plant and number of

seed/plant. However, the parent Giza- 643 (P_4) and Moshtohor- 109 (P_6) exhibited low SI for yield and yield components.

The mean values of SI for F_1 hybrids are presented in table (2); of all hybrids, eleven, thirteen and fourteen ones had the highest tolerance of stress environments for number of pods/plant, seeds/plant, seed yield/plant and the 100-seed weight, respectively. The crosses; Giza- 717 (P_2) × Moshtohor- 103 (P_7) and Giza- 717 (P_2) × Triple white (P_3) for number of pods/plant, Giza blanka (P_1) × Giza- 461 (P_5), Giza- 717 (P_2) × Triple white (P_3) and Giza- 643 (P_4) × Giza- 461 (P_5) for number of seed/plant, Giza- 717 (P_2) × Moshtohor- 103 (P_7), Giza- 717 (P_2) × Moshtohor- 109 (P_6), Giza blanka (P_1) × Moshtohor- 109 (P_6), Giza- 717 (P_2) × Giza- 643 (P_4) and Giza- 461 (P_5) × Moshtohor- 109 (P_6) for 100-seed weight and the crosses; Giza blanka (P_1) × Giza- 461 (P_5), Giza- 717 (P_2) × Moshtohor- 109 (P_6) and Giza- 643 (P_4) × Giza- 461 (P_5) for seed yield/plant seemed to be the best drought tolerant ones for these traits. However, the crosses; Giza- 717 (P_2) × Moshtohor- 109 (P_6) and Triple white (P_3) × Giza- 461 (P_5) were the most drought tolerant crosses for seed yield and its studied components. Also, the crosses involve in Giza- 461 (P_5) or Giza- 717 (P_2) gave the best tolerance for seed yield/plant, therefore, these two varieties seemed to be the best parents for drought tolerance.

Heterosis

Mean squares for parents vs. crosses as an indication to average heterosis in overall crosses were significant for SI of number of seeds/plant and seed yield/plant (Table 1). The parental mean values for SI were significantly higher than F_1 mean performance for both traits (Table 2).

Heterosis expressed as the percentage of F1 mean performance from better parent values for SI of number of pods and seed/plant, 100-seed weight and seed yield/plant are presented in table (3).

For SI of number of pods/plant, the cross Giza- 717 (P_2) × Moshtohor- 103 (P_7) expressed significant negative heterotic effect relative to better parent value for SI of number of seed/plant, seven crosses exhibited significant negative heterotic effect relative to better parent values. The highest negative heterotic effects were obtained from crosses Giza blanka (P_1) × Giza- 461 (P_5), Giza- 643 (P_4) × Giza- 461 (P_5), Giza- 643 (P_4) × Moshtohor- 109 (P_6), Moshtohor- 109 (P_6) × Moshtohor- 103 (P_7) and Giza- 717 (P_2) × Triple white (P_3).

For SI of 100-seed weight, three cross combinations expressed significant negative heterotic effect relative to better parent values. The high desirable heterotic effect were detected in Giza blanka (P_1) × Moshtohor- 109 (P_6), Triple white (P_3) × Moshtohor- 109 (P_6) and Giza- 643 (P_4) × Moshtohor- 109 (P_6).

For SI of seed yield/plant, six parental combinations significantly exceeded better parents. These crosses are Giza- 643 (P_4) × Moshtohor- 109 (P_6), Giza blanka (P_1) × Giza- 461 (P_5), Giza- 643 (P_4) × Giza- 461 (P_5), Giza blanka (P_1) × Giza- 643 (P_4) and Triple white (P_3) × Moshtohor- 109 (P_6) which has the best desirable heterotic effects for SI of seed yield, also showed high SI for one or more of yield components. Similar results were

obtained by Grzesiak *et al.,* (1996 and 1997), Duarte and Tavares (1998), and Toker and Cagirgan (1998).

TABLE (2). Genotype mean performance for stress susceptibility index (SI) of yield and yield components in F_1 generation and parents.

Genotype	SI for No. of pods/plant	SI for No. of seeds/plant	SI for 100-seed weight	SI for seed yield/plant
Giza blanka (P_1)	0.743	0.889	0.763	0.884
Giza-717 (P_2)	0.583	0.717	0.315	0.671
Tripe-white. (P_3)	0.616	1.100	1.536	1.157
Giza-643 (P_4)	1.311	1.386	1.123	1.318
Giza-461 (P_5)	1.132	0.943	0.675	0.913
Moshtohor-109 (P_6)	1.264	1.564	1.657	1.505
Moshtohor-103 (P_7)	0.581	0.959	1.162	1.026
$P_1 \times P_2$	1.007	1.249	2.523	1.388
$P_1 \times P_3$	1.653	1.590	1.315	1.492
$P_1 \times P_4$	1.364	0.541	0.703	0.597
$P_1 \times P_5$	0.675	0.393	0.769	0.492
$P_1 \times P_6$	1.675	1.640	0.329	1.441
$P_1 \times P_7$	0.798	0.973	0.943	0.977
$P_2 \times P_3$	0.488	0.444	1.069	0.591
$P_2 \times P_4$	1.157	1.089	0.360	0.987
$P_2 \times P_5$	0.912	0.596	1.961	0.869
$P_2 \times P_6$	0.626	0.555	0.263	0.526
$P_2 \times P_7$	0.405	1.336	0.180	1.171
$P_3 \times P_4$	0.658	1.168	1.159	1.157
$P_3 \times P_5$	0.538	0.613	0.534	0.624
$P_3 \times P_6$	0.989	0.738	0.635	0.743
$P_3 \times P_7$	1.084	1.232	0.942	1.179
$P_4 \times P_5$	1.074	0.436	0.954	0.562
$P_4 \times P_6$	1.308	0.629	0.535	0.637
$P_4 \times P_7$	1.452	1.778	0.855	1.596
$P_5 \times P_6$	1.275	0.866	0.368	0.803
$P_5 \times P_7$	0.936	0.795	1.207	0.882
$P_6 \times P_7$	0.925	0.597	2.740	1.011
$\bar{x}$ Overall parents	0.890	1.085	1.033	1.068
$\bar{x}$ Overall F_1's	0.999	0.917	0.969	0.939
$\bar{x}$ Overall genotypes	0.972	0.959	0.985	0.971
L.S.D. $_{0.05}$	0.650	0.610	0.660	0.580
L.S.D. $_{0.01}$	0.750	0.710	0.760	0.670

Combining Ability

The mean squares associated with general and specific combining abilities were significant for yield and the three yield components. To give an idea about the predicated performance of single-cross progeny in each trait, the relative size of general and specific combining ability mean squares may be helpful. Low G.C.A/S.C.A ratios of less than unity were detected for number of seeds/plant, seed yield per plant and 100-seed weight, indicating the predominance of non-additive gene action in the inheritance of SI for such traits. However, results showed that the number of pods/plant expressed high G.C.A/S.C.A ratio, which exceeded the unity, indicating the predominance of additive and additive by additive types of gene action in the inheritance of SI for this trait.

Estimates of G.C.A. effects ($\hat{g}_i$) for individual parent of each trait for (SI) are presented in table (4).

The parental cv. Giza- 717 (P_2) seemed to be first combiner for SI of number of pods/plant and the second one for SI of number of seeds and seed yield/plant and it ranked the third combiner for 100-seed weight.

The parental cv. Giza- 461 (P_5) seemed to be the best combiner for SI of number of seed and seed yield/plant at the same direction it gave significant negative value for SI of 100-seed weight. The parental cv. Triple white (P_3) expressed negative significant of SI for number of pods/plant and 100-seed weight, while the parental cv. Giza- 643 (P_4) was highly drought tolerant for 100-seed weight. Therefore, the two parental cvs. Giza- 717 (P_2) and Giza- 461 (P_5) could be considered as excellent parents in breeding programs towards releasing tolerant variety for drought stress.

Significant positive correlation coefficient values between parental performance of SI and its $\hat{g}_i$ were detected for number of pods/plant (Table 4). This finding indicated that the parental materials gave a good index of intrinsic performance of their general combining ability effects. Therefore, selection among the tested parents for initiating any proposed breeding program could be practiced either on the basis of the mean performance or with similar efficiency ($\hat{g}_i$). For other traits, insignificant coefficient values were detected between the two variables. Also, it is concluded that the non-additive gene action had the greatest role in the expression of these traits, which is in complete agreement with the finding given in table (1). Similar results were obtained by Omar *et al.* (1998).

Specific combining ability effect of the parental combinations computed for SI for yield and yield components are presented in table (5). Six, nine and eleven hybrids exhibited significant negative S_{ij} for number of pods/plant, seeds/plant, 100-seed weight seed yield/plant, respectively, which indicated tolerance for drought stress. The superiority of the two crosses; Giza blanka (P_1) × Giza- 461 (P_5) and

Giza blanka (P_1) × Moshtohor-103 (P_7) for SI of seed yield/plant may be due to significant negative S_{ij} of the three yield components, *i.e.* number of pods and seeds/plant and 100-seed weight. The superiority of the other crosses Giza blanka (P_1) × Giza- 643 (P_4), Giza- 717 (P_2) × Triple white (P_3), Giza- 717 (P_2) × Moshtohor- 109 (P_6), Triple white (P_3) × Giza-643 (P_4), Triple white (P_3) × Moshtohor- 109 (P_6), Triple white (P_3) ×Moshtohor- 103 (P_7), Giza- 643 (P_4) × Giza- 461 (P_5) and Giza- 461 (P_5)×Moshtohor- 109 (P_6) for SI of seed yield/plant may be due to significant negative S_{ij} of SI of one or more of yield components.

TABLE (3). Percentage of heterosis in the F1 generation to better parent (BP) for the SI of yield and yield components.

Crosses	SI for No. of pods/plant	SI for No. of seeds/plant	SI for 100-seed weight	SI for seed yield/plant
Giza blanka × Giza-717	72.73**	74.20**	700.95**	106.86**
Giza blanka × Tripe-white	168.34**	78.85**	72.35**	68.78**
Giza blanka × Giza-643	83.58**	-39.15**	-7.86	-32.47
Giza blanka × Giza-461	-9.15	-55.79	13.93	-44.34**
Giza blanka × Moshtohor-109	125.44**	84.48**	-56.88**	63.01**
Giza blanka × Moshtohor-103	37.35	9.45	23.59	10.52
Giza-717 × Tripe-white	-16.30	-38.08*	239.37**	-11.92
Giza-717 × Giza-643	98.46**	51.88**	14.29	47.09*
Giza-717 × Giza-461	56.43*	-16.88	522.54**	29.51
Giza-717 × Moshtohor-109	7.38	-22.59	-16.51	-21.61
Giza-717 × Moshtohor-103	-30.29*	86.33**	-42.86	74.52**
Tripe-white × Giza-643	6.82	6.18	3.21	0.00
Tripe-white × Giza-461	-12.66	-34.99**	-20.89	-31.65*
Tripe-white × Moshtohor-109	60.55**	-32.91**	-58.66**	-35.78**
Tripe-white × Moshtohor-103	86.57**	23.82	-18.93	14.912
Giza-643 × Giza-461	-5.12	-53.76**	41.33	-38.44*
Giza-643 × Moshtohor-109	3.48	-54.62**	-52.36**	-51.67**
Giza-643 × Moshtohor-103	149.91**	78.69**	-23.86	55.56**
Giza-461 × Moshtohor-109	12.63	-8.17	-45.48	-12.05
Giza-461 × Moshtohor-103	61.10*	-15.69	78.81**	-3.40
Moshtohor- 109 × Moshtohor-103	59.21*	-40.00**	135.80**	-1.46

* and ** indicate significant at 0.05 and 0.01 levels of probability, respectively.

Stress tolerant genotypes, as defined by SI values, need not to have high yield potential since SI provides a measure of tolerance based on minimization of yield loss under stress rather than on stress yield per se.

Genotypes identified as stress tolerance using SI should possess tolerance mechanisms, which may need to be incorporated into germplasm with higher yield potential for development of high yielding and stress tolerant cultivars.

TABLE (4). Estimates of general combining ability (G.C.A) effects for SI for yield and its components of the parental varieties.

Parental variety or line		SI for No. of pods/plant	SI for No. of seeds/plant	SI for 100-seed weight	SI for seed yield/plant
Giza blanka	(P_1)	0.06*	0.09**	0.23**	0.10**
Giza- 717	(P_2)	-0.25**	-0.05*	-0.10**	-0.12**
Triple white	(P_3)	-0.14**	0.03	-0.17**	-0.04
Giza- 643	(P_4)	0.19**	0.06*	-0.13**	0.08**
Giza- 461	(P_5)	-0.04	-0.25**	-0.08*	-0.26**
Moshtohor- 109	(P_6)	0.17**	0.02	0.10**	0.14**
Moshtohor- 103	(P_7)	0.01	0.10**	0.15**	0.10**
L.S.D. 0.05 $\hat{g}_i$		0.06	0.05	0.07	0.06
L.S.D. 0.01 $\hat{g}_i$		0.09	0.07	0.09	0.08
L.S.D. 0.05 ($\hat{g}_i - \hat{g}_j$)		0.10	0.08	0.10	0.09
L.S.D. 0.01 ($\hat{g}_i - \hat{g}_j$)		0.13	0.11	0.14	0.12
r		0.75*	0.26	0.05	0.57

* and ** indicate significant at 0.05 and 0.01 levels of probability, respectively.
r = correlation coefficient between the parental performances and their G.C.A. effects.

TABLE (5). Estimate of specific combining ability (S.C.A) effect for SI of yield and yield components of F_1 generation.

Crosses	SI for No. of pods/plant	SI for No. of seeds/plant	SI for 100-seed weight	SI for seed yield/plant
Giza blanka × Giza-717	0.16	0.83**	1.46**	0.72**
Giza blanka × Tripe-white	0.71**	0.47**	-0.77**	0.18*
Giza blanka × Giza-643	0.13	-0.57**	-0.39**	-0.68**
Giza blanka × Giza-461	-0.38**	-0.42**	-0.37*	-0.48**
Giza blanka × Moshtohor-109	0.44**	-0.48**	-0.02	0.50**
Giza blanka × Moshtohor-103	-0.29**	-0.19**	-0.45**	-0.27**
Giza-717 × Tripe-white	-0.11	-0.39**	-0.48**	-0.43**
Giza-717 × Giza-643	0.21**	0.10	-0.42**	0.14
Giza-717 × Giza-461	0.18	-0.06	1.21**	-0.28**
Giza-717 × Moshtohor-109	-0.32**	-0.48**	0.09	-0.32**
Giza-717 × Moshtohor-103	-0.33**	0.31**	-0.87**	0.26**
Tripe-white × Giza-643	-0.37**	-0.43**	-0.18	-0.50**
Tripe-white × Giza-461	-0.27**	0.09	-0.38*	0.26**
Tripe-white × Moshtohor-109	-0.03	-0.28**	-0.28	-0.44**
Tripe-white × Moshtohor-103	0.23**	-0.48**	1.88**	-0.43**
Giza-643 × Giza-461	-0.07	-0.32**	0.15	-0.53**
Giza-643 × Moshtohor-109	-0.03	0.08	0.22	0.19**
Giza-643 × Moshtohor-103	0.27**	0.61**	-0.19	0.62**
Giza-461 × Moshtohor-109	0.15	-0.12	-0.48**	-0.21**
Giza-461 × Moshtohor-103	-0.02	-0.02	0.16	0.20**
Moshtohor- 109 × Moshtohor-103	-0.06	0.15*	-0.31	0.19**
L.S.D 0.05	0.19	0.15*	0.20	0.17
(S_{ij}) 0.01	0.25	0.20	0.26	0.23
L.S.D 0.05	0.28	0.22	0.29	0.25
($S_{ij} - S_{ik}$) 0.01	0.37	0.30	0.39	0.34
L.S.D 0.05	0.26	0.21	0.27	0.24
($S_{ij} - S_{kl}$) 0.01	0.35	0.28	0.37	0.31

* and ** indicate significant at 0.05 and 0.01 levels of probability, respectively.

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تحليل التباين التبادلى لتحديد القدرة العامة والخاصة على التحمل تحت الإجهاد المائى البيئى (تحمل الجفاف) فى الذرة الرفيعة المطرية

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تم عمل جميع الهجن الممكنة بين سبعة آباء مختلفة وراثيا وذات أصول وراثية متباعدة وهى جيزة بلانكا، جيزة Triple white، جيزة ēčē، جيزة ĒĐď، جيزة ĐĒč، مشتهر čČě، مشتهر ČČď.

وقد اجرى هذا البحث خلال موسمى ĎČČČ/ěě ، čěěě/ěĚ فى الموسم الأول، و فى الموسم التالى أقيمت تجربة فى قطاعات كاملة العشوائية ذات ستة مكررات بغرض تقييم الآباء والهجن الناتجة منها حيث تم رى الثلاثة مكررات من التجربة كل Đđ يوم (معاملة الرى العادى) وتركت الثلاثة مكررات الأخرى للنمو تحت ظروف الأمطار السائدة بمنطقة مريوط التابعة لمحافظة الأسكندرية والتى بلغ متوسطها فى ذلك العام čď Đ مم.

هم النتائج المتحصل عليها اما يلى:

كان تباين معاملى الحساسية للإجهاد البيئى للتراكيب الوراثية ومكوناتها معنويا للصفات تحت الدراسة فيما عدا تباين قوة الهجين لصفتى عدد القرون بالنبات ووزن الـ ČČČ بذرة.

اظهرت الهجن جيزة ĒĐď × مشتهر čČě، جيزة بلانكا × جيزة ĐĒč، جيزة ĒĐď × جيزة ĐĒč، جيزة بلانكا × جيزة ĒĐď، Triple white × مشتهر čČě احسن قوة هجين مرغوب فيها لصفة محصول البذرة بالنبات.

اظهر الأب جيزة ēčē أعلى القيم فى قدرته العامة على التآلف لمعامل الحساسية للإجهاد البيئى لصفة عدد القرون بالنبات.

اظهر الأب جيزة ĐĒč قدرة عالية على التآلف لمعامل الحساسية للإجهاد البيئى لصفتى عدد البذور ومحصول البذرة بالنبات.

وبذلك يمكن اعتبار الصنفين جيزة ēčē، جيزة ĐĒč احسن الآباء فى برنامج التربية الموجه للحصول على صنف يتحمل ظروف الجفاف.

حققت ستة وتسعة وثمانية و إحدى عشر هجينا معنوية سالبة لتقديرات القدرة الخاصة على التآلف لصفات عدد القرون والبذور بالنبات ووزن الـ ČČČ بذرة ومحصول البذرة بالنبات على التوالى، مما يشير إلى تحمل هذه الهجن لظروف الجفاف

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EFFECT OF POLYVINYL ACETATE AND BIOFERTILIZERS ON THE PRODUCTIVITY OF SUGAR BEET AND SOIL PROPERTIES UNDER SALINE IRRIGATION WATER

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A field study was done at Ras Sudr Experimental Station of the Desert Research Center during 1998-1999 winter season to evaluate the effect of polyvinyl acetate synthetic soil conditioner and /or biofertilizers on the properties of calcareous soil as well as yield and mineral contents of sugar beet plants irrigated by saline water. The treatments include polyvinyl acetate (PVAc) as synthetic soil conditioner at three rates; *i.e*, 0.2, 0.4 and 0.6 L/m^2 and biofertilizers; either in the individual form of phosphate dissolving bacteria (Bio_1) or in a mixture form of both PDB and nitrogen fixing bacteria (Bio_2). The rates of (PVAc) were equivalent to 840, 1680 and 2520 L/fed.

Results indicated that the yields of roots and leaves of sugar beet plants were significantly increased when soil was treated either with PVAc individually or in combination with biofertilizers. The combination between $PVAc_2$ and Bio_2 resulted in greater values of sugar beet yield than those obtained when each applied individually. Also, the N,P,K, Fe, Mn and Zn contents of both roots and leaves were remarkably increased with different magnitudes by the application of either soil conditioners and/ or biofertilizers. The highest uptake and concentration of such nutrients were associated in most cases with ($PVAc_2$ +Bio_2) treatment.

The application of biofertilizers emphasized the role of PVAc on reducing soil pH and soil salinity while it increased the availability of N, P, Fe, Mn and Zn as well as increased the counts of *Azotobacter* sp., *Azospirillium* sp., phosphate dissolving bacteria and microbial activity.

Keywords: calcareous soil, polyvinyl acetate, biofertilization, sugar beet plants, nutrient availability, total soluble solids, microbial activity.

It is well known that calcareous soil have low nutrients particularly micronutrients and inferior soil/ water relations and high content of calcium carbonate that results in high soil pH. The reclamation of such soils require the addition of soil conditioners such as synthetic soil conditioners including long chain hydrocarbon derivatives such as Polyacryl amide, polyvinyl acetate, hydrogel and petroleum by-products (Abd El Fattah *et al*., 1990; Hashem, 1997; Wassif *et al*. 1997; El Maghraby and Wassif,1999 and El Maghraby,2000). Such materials may have a role in raising the buffering capacity of the soils and lead to increase the productivity (Balogh, 1970). Also, biofertilization is considered the most important factor in reducing the required chemical fertilizers, improving soil fertility and increasing soil productivity (Abd El-Ghany *et al*., 1997 and El Kholy, 1998). However, the use of such materials is more efficient on the use of good quality water. Information on the efficiency of such materials with the use of saline irrigation water is still limited.

Therefore, the aim of present work is to study the effect of individual or combined application of polyvinyl acetate as soil conditioner and /or biofertilizers on the properties of calcareous soil and the productivity of sugar beet grown under saline irrigation water.

MATERIALS AND METHODS

A field experiment was carried out during 1998-1999 winter season in the Agriculture Experimental Station of the Desert Research Center at Ras Sudr, South Sinai. The experimental soil is highly calcareous (54.3 % $CaCO_3$) and loamy sand in texture with high salt content. The physical and chemical properties of the experimental site (0-30cm) are given in table (1a). The experiment was conducted in a complete randomized block design and consisted of 12 treatments and each treatment was replicated four times. The treatments were :

1- Non treated soil (control).
2- Seed inoculation with phosphate dissolving bacteria (Bio_1).
3- Seed inoculation with phosphate dissolving bacteria and nitrogen fixing bacteria (Bio_2).
4- Polyvinyl acetate at rate of 0.2 L /m^2 $PVAc_1$.
5- Polyvinyl acetate at rate of 0.4 L /m^2 $PVAc_2$
6- Polyvinyl acetate at rate of 0.6 L /m^2 $PVAc_3$
7- $PVAc_1$ + Bio_1.
8- $PVAc_2$ + Bio_1.
9- $PVAc_3$ + Bio_1.
10- $PVAc_1$ + Bio_2.
11- $PVAc_2$ + Bio_2.
12- $PVAc_3$ + Bio_2.

Sugar beet seeds (*Beta Vulgaris L.)* were sown in 15th November 1998 in rows 30 cm apart and 20 cm between plants. Before sowing the seeds of the biofertilizer treatments were mixed with a paste of biofertilizers culture using Arabic gum (20%) as adhesive agent. After a day of sowing and irrigation, polyvinyl acetate was sprayed on the soil surface as a film for their plots. Irrigation was carried out every 10 days using the saline well water (8332ppm). Table (1b) depict some of the chemical analysis of well water used in irrigation.

All treatments received the basal rates of N, P and K fertilizers as follows:

- 30 Kg P_2O_5 / fed. as super phosphate (15.5%) applied during soil preparation.
- 70 Kg N/fed. as NH_4NO_3 (33.5%) at two equal doses applied at one and three months from planting.
- 48 Kg K_2O/fed. as K_2SO_4 (48%) at two equal doses applied at the same time with nitrogen.

Plants were harvested at maturity in15 th June 1999 and the total yield of roots and leaves of every treatment were recorded and statistically analyzed. (Snedecor and Cochran, 1967). The concentration of total soluble solid (TSS) in roots was determined according to (A.O.A.C, 1965). Also, N, P, K, Fe, Mn and Zn contents of sugar beet roots and leaves were determined (Chapman and Pratt, 1961 and Cottenie, 1980).

After harvesting, soil samples from the experimental plots (0-30cm) were collected for the determination of EC, pH, soluble ions of soil paste extract, total nitrogen and available P, DTPA-Fe, Mn and Zn using the methods described by Page *et al*. (1982). Also, Rizosphere soil sample taken after one, two months and after harvesting for the determination of the biological activities that included CO_2 evolution (Shehata, 1972), *Azotobacter* sp. and *Azospirillium* sp. by nitrogen deficient medium according to Dobereiner (1978), and phosphate dissolving bacteria (PDB) using methods described by Mahmoud (1988).

RESULTS AND DISCUSSION

Sugar Beet Yields

The yield of sugar beet roots and leaves as affected by PVAc and /or biofertilization are given in table (2). Obviously, the individual application of PVAc resulted in a significant increase in both sugar beet roots and leaves. The rate of increase is depended on the rate of applied PVAc. The highest rate of increment was associated with the $PVAc_2$ treatment, as it reached 46.85% for roots and 93.33 % for leaves over the control. Similar trend was obtained for the application of biofertilizers, as the yields of both roots and leaves were significantly increased. The highest rate of increment in roots and leaves amounted to 43.36 % and 77.33 % due to Bio_2 treatment.

TABLE (1a). Physical and chemical properties of the experimental site at Ras Sudr.

Particle size distribution (%)			Textural class	$CaCO_3$ (%)	O.M. (%)	ESP
Sand	Silt	Clay				
74.47	10.90	14.63	Sandy Loam	54.30	0.60	13.18

pH (soil paste)	EC (dS/m)	Soluble cations (meq/L)				Soluble anions (meq/L)				Total N (ppm)	Available nutrients (ppm)				
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$		K	P	Fe	Mn	Zn
7.28	16.36	55.40	32.98	75.83	0.54	n.d.	8.00	114	42.75	392	29.5	1.4	3.2	2.7	0.5

TABLE (1b). Chemical composition of the used saline well water during the growing season .

pH	EC (dS/m)	Soluble cations (meq/L)				Soluble anions (meq/L)				SAR	Micronutrients (ppm)		
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$		Fe	Mn	Zn
7.98	13.02	25.8	27.66	79.86	0.42	n.d.	3.4	93.1	37.24	15.45	0.17	0.1	0.02

n.d. = not detected

The favorable effect of PVAc and biofirtilizers on increasing sugar beet yield may be rendered to their effect on enhancing some physical and chemical properties of soil. Such effects were reducing soil pH, EC values and increasing the availability of certain plant nutrients (Table 4). These results were in agreement with those reported by Wassif *et al*. (1997), Hashem (1997) and El Maghraby (2000).

The above mentioned results were confirmed by the combined application of the imposed treatments as the yield of both roots and leaves were significantly increased due to the combined application of any rate of PVAc and any type of biofertilizers. Generally, the efficiency of the imposed treatment on increasing sugar beet yields could be arranged in the following order: $PVAc_2 + Bio_2 > PVAc_1 + Bio_2 > PVAc_3 + Bio_2 > PVAc_2 + Bio_1 > PVAc_2 > PVAc_3 + Bio_1 > Bio_2 > PVAc_3 > PVAc_1 + Bio_1 > Bio_1 > PVAc_1 >$ control.

Total Soluble Solids (TSS)

Data in table (2) show that the percentages of TSS in sugar beet roots were greatly affected by the application rate of PVAc soil conditioner and / or the type of biofertilization. In the control treatment, the percentages of TSS were so much higher as compared to the other treatments. This fact may be due to the relatively low yields and higher soil EC values of the control treatment which makes sugar plants grown under relatively high salt stress consequently the concentration of TSS were increased. On the other hand, the percentages of TSS were decreased by 7.07%, 13.78% and 7.77% relative to the control treatment due to $PVAc_1$ and $PVAc_2$ and $PVAc_3$ respectively, while the respective decrement referring to Bio_1 and Bio_2 amounted to 21.20% and 20.49% respectively. This may be due to the dilution effect resulted from increasing the yield of sugar beet roots as a result of applying PVAc and biofertilization. However, calculating the total contents of TSS (TSS percent x Total root yield ton /fed.) could be emphasize the role of such materials on increasing TSS of sugar beet roots. The positive effect of PVAc and / or biofertilizers on increasing the total contents of TSS may be due to their role on increasing the uptake of certain plant nutrients by plant roots (Table3). Also, due to the role of such materials on increasing plant growth. Such results were confirmed by the combined action between PVAc and biofertilizers as the highest total contents of TSS were associated with the combined treatment of $PVAc_2 + Bio_2$. Such results were stood in agreement with those reported by Hashem (1997).

The Mineral Content of Sugar Beet Plants

Data presented in table (3) and figs (1and2) show the effect of adding PVAc and / or biofertilization in the N, P, K, Fe, Mn and Zn contents of sugar beet roots and leaves. The increase in the concentration of N in sugar beet roots due to the application of PVAc reached 45.45%, 49.09% and 47.27% with $PVAc_1$, $PVAc_2$ and $PVAc_3$ relative to the control treatment, respectively. While the respective increment in the sugar beet leaves reached

31.96%, 34.02% and 38.14%. Also, the increment in such property due to biofertilization amounted 38.18% and 70.91% in roots and 61.86% and 64.95% with Bio_1 and Bio_2 treatments relative to the control, respectively. Similar trends were obtained in the case of P, K, Fe, Mn and Zn contents in both roots and leaves of sugar beet plants. The application of PVAc supported to biofertilization emphasized the role of biofertilization on increasing the concentrations of N, P, K, Fe, Mn and Zn. This may be due to that the PVAc treatment increased the soil moisture content of the soil (Abd El-Ghany, 1996) and enhancing the formation of water stable aggregates (Tayel and Anter, 1978 and Hashem, 1997). This creates a good medium for the soil microorganisms and / or the applied biofertilizers to the decay of soil organic matter. Consequently the availability of certain plant nutrients increase. This will reflect in increasing the concentrations of N, P, K, Fe, Mn and Zn due to the combinations between the studied treatments. Generally, the highest values in the concentrations of such nutrients were associated in most cases with the combined treatment of $PVAc_3 + Bio_2$.

TABLE (2). Effect of polyvinyl acetate (PVAc) and biofertilizers application on yield and total soluble solids (TSS) of sugar beet.

Treatments	Roots	Leaves	T.S.S. (%)	T.S.S. Ton/fed.
	Ton/fed.			
Control	8.58	1.50	28.30	2.43
$PVAc_1$	11.60	2.60	26.30	3.05
$PVAc_2$	12.60	2.90	24.40	3.07
$PVAc_3$	11.90	2.80	26.10	3.11
Bio_1	11.60	2.58	22.30	2.59
Bio_2	12.30	2.66	22.50	2.77
$PVAc_1+Bio_1$	11.70	3.00	20.90	2.45
$PVAc_2+Bio_1$	13.50	3.20	22.00	2.97
$PVAc_3+Bio_1$	12.40	2.95	26.70	3.31
$PVAc_1+Bio_2$	13.80	2.23	21.30	2.94
$PVAc_2+Bio_2$	14.20	3.33	23.60	3.35
$PVAc_3+Bio_2$	13.60	2.95	24.00	3.26

Factor	Statistical analysis	
	LSD at 5% level	
	Roots	Leaves
PVAc	1.18	0.55
Bio	0.97	0.64
PVAc x Bio	1.37	0.45

TABLE (3). Effect of polyvinyl acetate (PVAc) and biofertilizers on mineral content of sugar beet plants.

Treatments	N	P	K	Fe	Mn	Zn	N	P	K	Fe	Mn	Zn
	(%)			(ppm)			uptake (Kg/fed.)					
	Roots											
Control	0.55	0.14	0.40	82.00	18.00	51.00	47.19	12.01	34.32	0.70	0.15	0.44
PVAc1	0.80	0.26	0.53	288.00	34.00	94.00	89.60	29.12	59.36	3.23	0.38	1.09
PVAc2	0.82	0.26	0.58	158.00	27.00	57.00	103.32	32.76	73.08	1.99	0.34	0.72
PVAc3	0.81	0.27	0.60	303.00	28.00	80.00	96.39	32.13	71.40	3.61	0.33	0.95
Bio1	0.76	0.20	0.54	186.00	26.00	69.00	88.16	23.20	62.64	2.16	0.30	0.80
Bio2	0.94	0.24	0.55	207.00	21.00	68.00	115.62	29.52	67.65	2.55	0.26	0.84
PVAc1+Bio1	0.87	0.26	0.79	154.00	20.00	66.00	101.79	30.42	92.43	1.80	0.23	0.77
PVAc2+Bio1	0.62	0.27	1.20	158.00	26.00	58.00	83.70	36.45	162.00	2.13	0.35	0.78
PVAc3+Bio1	0.59	0.36	0.65	146.00	15.00	43.00	73.16	44.64	80.60	1.81	0.19	0.53
PVAc1+Bio2	0.87	0.34	0.63	350.00	25.00	87.00	120.06	46.92	86.94	4.83	0.35	1.20
PVAc2+Bio2	0.92	0.28	0.88	219.00	21.00	60.00	130.64	39.76	124.96	3.11	0.30	0.85
PVAc3+Bio2	1.10	0.36	1.00	196.00	26.00	64.00	149.60	48.96	136.00	2.67	0.35	0.87
Leaves												
Control	0.97	0.17	2.60	613.00	40.00	85.00	14.55	2.55	39.00	0.92	0.06	0.13
PVAc1	1.28	0.18	3.10	562.00	33.00	98.00	33.28	4.68	80.60	1.46	0.09	0.25
PVAc2	1.30	0.31	4.30	1592.00	59.00	161.00	37.70	8.99	124.70	4.62	0.17	0.47
PVAc3	1.34	0.56	3.90	418.00	40.00	66.00	37.52	15.68	109.20	1.17	0.11	0.18
Bio1	1.57	0.26	3.30	533.00	39.00	73.00	40.51	6.71	85.14	1.38	0.10	0.19
Bio2	1.60	0.35	3.60	2116.00	57.00	154.00	42.56	9.31	95.76	5.63	0.15	0.41
PVAc1+Bio1	1.50	0.30	3.40	589.00	34.00	96.00	45.00	9.00	102.00	1.77	0.10	0.29
PVAc2+Bio1	1.55	0.37	3.90	605.00	36.00	72.00	49.60	11.84	124.80	1.94	0.12	0.23
PVAc3+Bio1	1.62	0.45	3.90	757.00	45.00	84.00	47.79	13.28	115.05	2.23	0.13	0.25
PVAc1+Bio2	1.00	0.30	3.75	955.00	44.00	119.00	22.30	6.69	83.63	2.13	0.10	0.27
PVAc2+Bio2	1.27	0.44	4.35	1294.00	50.00	84.00	42.29	14.65	144.86	4.31	0.17	0.28
PVAc3+Bio2	1.46	0.20	4.10	1351.00	70.00	107.00	43.07	5.90	120.95	3.99	0.21	0.32

For the sake of clarity, the uptake of such nutrients were calculated (concentration of nutrient x yield of sugar beet) and the data are given in table (3). The result indicates the beneficial use of the PVAc and/or

biofertilizer on increasing the uptake of macro and micronutrients by sugar beet plants. The favorable effect of PVAc and / or biofertilizers on increasing the uptake of such nutrients may be refer to their role on decreasing the soil EC and soil pH values and increasing the availability of certain plant nutrients as was found in this study (Table 4). Sugar beet plants appeared to have a better environmental condition with low salt stress to achieve high growth yields. Consequently the uptake of the studied nutrients increased in both roots and leaves of sugar beet plants.

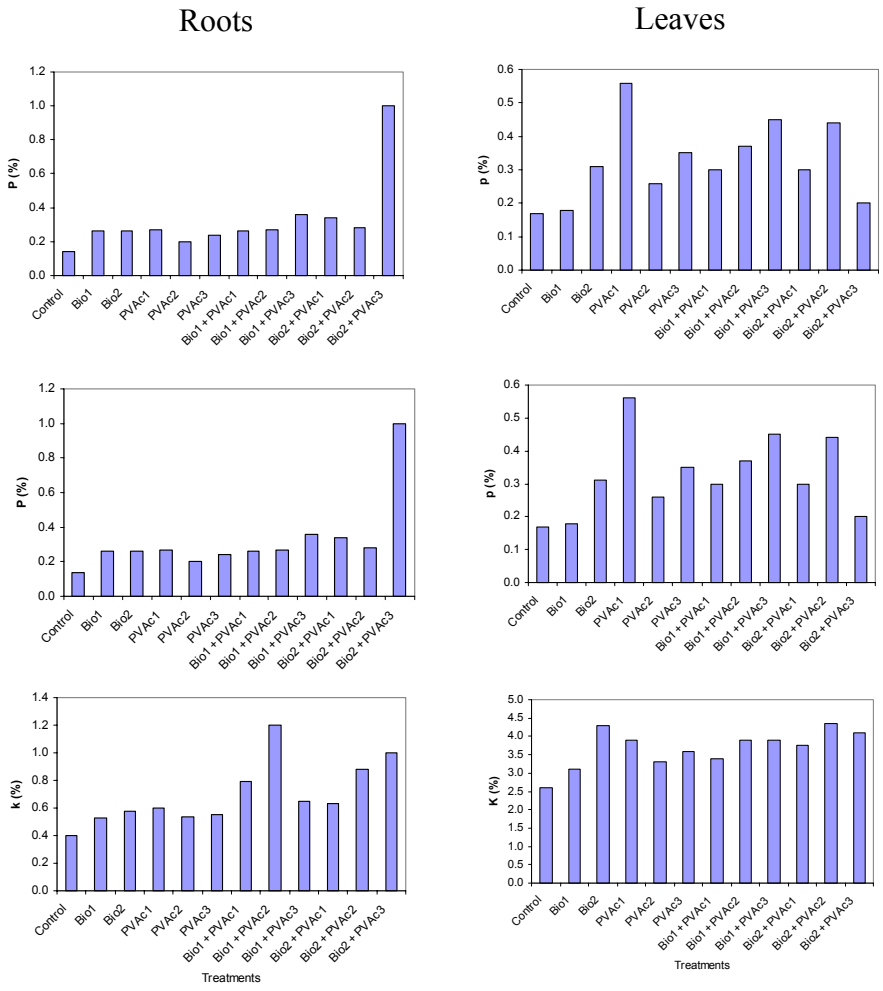

Fig. (1). Effect of polyvinyl acetate (PVAc) and biofertilizers on macronutrients concentration in sugar beet.

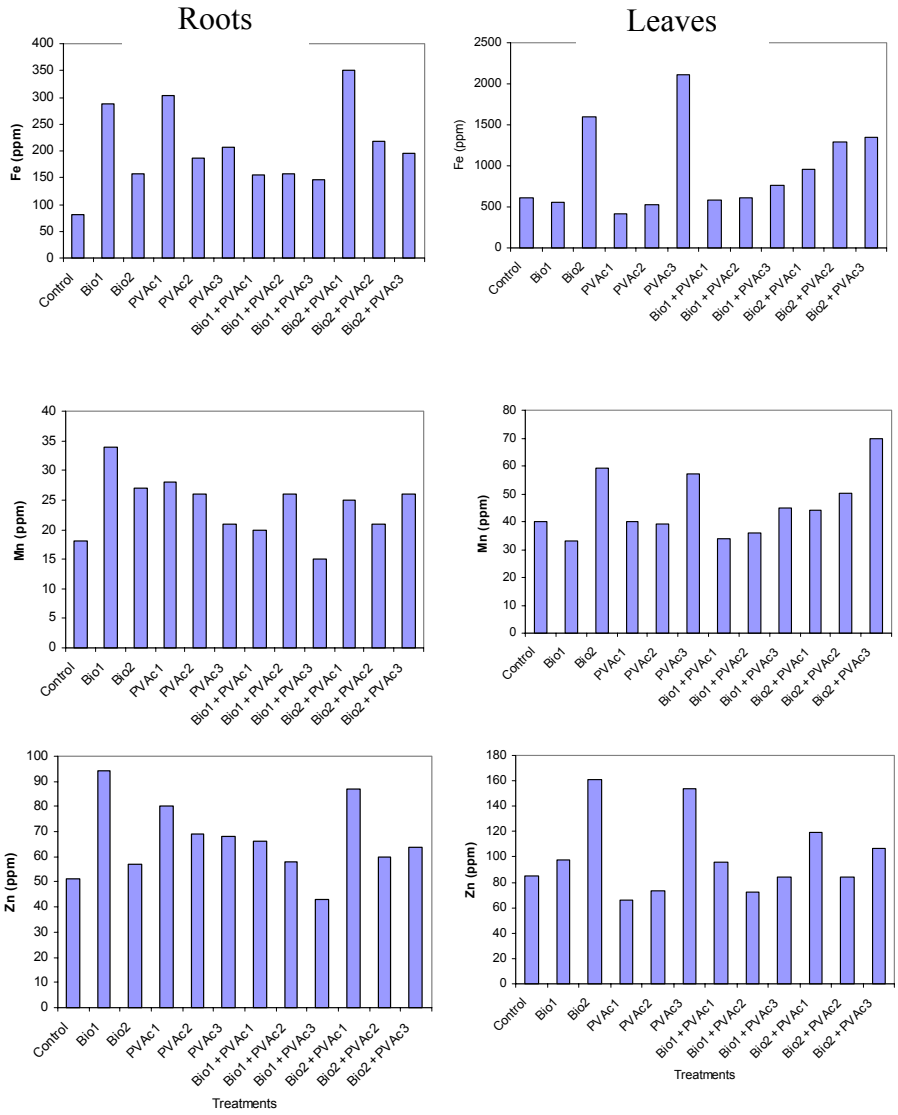

Fig. (2). Effect of polyvinyl acetate (PVAc) and biofertilizers on micronutrients concentration in sugar beet.

Soil Chemical Properties

Data in table (4) clearly appear that the soil pH and EC values were remarkably decreased affecting by soil conditioners and / or biofertilizers. With respect to polyvinyl acetate, data show that, the EC values were decreased below the control in the soil samples taken after harvesting by 44.42%, 63.55% and 66.65% due to $PVAc_1$, $PVAc_2$ and $PVAc_3$, respectively. This may be due to increasing the ability of calcareous soil to hold water against evaporation.

Consequently, more soluble salts will have the chance to the downward movement by the frequent irrigation. Such results were stood in agreement with the findings of Wassif *et al*. (1997), Hashem (1997) and El-Maghraby *et al*. (2000).

Regarding the effect of biofertilizers, data show very similar trends to those obtained with PVAc. As the respective decrement, EC values reached 51.27% and 61.43 % due to Bio_1 and Bio_2, respectively. Such results were in a harmony with Hashem (1997).The application of PVAc supported to biofertilizers greatly affected soil salinity. As, the EC values were sharply decreased with increasing the rate of PVAc application at any type of the used biofertilization. The combined treatment of Bio_2+$PVAc_2$ gained the highest EC reduction. Generally, the efficiency of the used materials on decreasing soil EC values could be arranged in the following order: $PVAc_2$+Bio_2 > $PAVc_3$+Bio_2 > $PVAc_3$+Bio_2 > $PVAc_3$+Bio_2 > Bio_2 > $PAVc_2$ +Bio_2 > $PVAc_3$+Bio_1 > $PVAc_1$+ Bio_1 > Bio_1 > $PVAc_1$ > $PVAc_1$ > control.

On the other hand, the decrement in the concentrations of the soluble ions of Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Cl^{-},HCO^{-}_3 and $SO^{=}_4$ in the conditioning plots may be refer to increasing the solubility of such ions due to increasing the ability of soil to hold water due to PVAc applications. Also, improving some physical properties of calcareous soil as water stable aggregates and structure (El-Maghraby and Wassif, 1999). Accordingly, more soluble salts will have the chance to be moved deeply to the lower soil depths with the following irrigation. The application of biofertilizers emphasized the role of PVAc soil conditioner in reducing the concentrations of such ions, such findings indicates that the application of PVAc with any type of biofertilizers specially Bio_2 could be a good management practices for improving calcareous soil properties as reducing the hazard effects created by Na and Cl ions; reducing soil salinity and soil pH values. The latter will reflect on the availability of certain plant nutrients as discussed later.

Nutrients Availability

Table (4) shows that the applications of PVAc either individually or in combination with any type of biofertilizers led to increase the availability of N,P,Fe,Mn and Zn. For example the rate of increase in total N average at 13.78%, 24.22% and 26.67% due to $PVAc_1$ $PVAc_2$ and $PVAc_3$ respectively. Also, the respective increments due to Bio_1 and Bio_2 reached to 25.56% and 73.32 %. The highest rate of increment was associated with the combined treatment of ($PVAc_2$ and Bio_2). The positive effect of the experimental treatments on increasing total N in soil could be refer to the higher root mass from the previous crops or improving the capacity of the soil to retain the applied chemical fertilizers and /or fixed nitrogen as in the case of PVAc and biofertilizers (Abd El-Ghany, 1996 and Hashem, 1997). The application of PVAc supported by any type of biofertilizers resulted also, in increasing the availability of soil P,Fe,Mn and Zn (Table 4). The highest rate of increment in the availability of such nutrients was associated with the combined treatment of ($PVAc_2$ and Bio_2). This may be due to the positive effect of such materials on reducing soil pH values as previously mentioned (Table 4).

TABLE (4). Soil chemical properties as affected by the experimental treatments.

Treatments	pH (soil paste)	EC dS/m (soil paste)	Soluble cations (meq/L)				Soluble anions (meq/L)				Total N (ppm)	Available nutrients (ppm)			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CL^{-}	$SO_4^{=}$		P	Fe	Mn	Zn
Control	7.84	25.10	8.66	5.90	236.16	0.30	-	2.64	242.46	5.92	450	3.5	3.0	1.2	0.4
$PVAc_1$	7.60	13.95	5.78	2.93	130.53	0.23	-	0.79	104.94	33.73	512	4.3	1.6	2.2	0.3
$PVAc_2$	7.62	9.15	3.99	2.22	85.12	0.21	-	0.93	68.31	22.29	559	5.5	2.5	2.0	0.4
$PVAc_3$	7.50	8.37	3.47	1.56	78.52	0.19	-	0.53	62.97	20.24	570	7.6	3.2	2.6	0.7
Bio_1	7.74	12.23	9.49	9.03	103.51	0.27	-	2.47	104.01	15.82	565	3.8	5.2	2.9	1.5
Bio_2	7.72	9.68	3.44	3.72	89.39	0.26	-	1.32	80.85	14.63	780	4.2	6.3	3.5	1.7
$PVAc_1$+Bio_1	7.70	11.34	5.91	1.60	105.56	0.37	-	1.96	84.00	27.47	545	5.0	4.5	3.0	1.2
$PVAc_2$+Bio_1	7.66	10.11	3.03	3.58	94.30	0.16	-	1.38	71.31	28.37	555	5.7	4.7	3.2	1.2
$PVAc_3$+Bio_1	7.62	11.06	3.69	5.72	100.98	0.24	-	0.83	94.86	14.94	570	8.1	4.6	3.3	1.5
$PVAc_1$+Bio_2	7.60	7.99	4.68	1.83	73.28	0.13	-	1.06	51.78	27.07	810	6.6	5.1	3.0	1.3
$PVAc_2$+Bio_2	7.40	7.38	2.89	1.74	69.07	0.16	-	0.55	49.52	23.79	903	7.9	6.7	4.4	1.8
$PVAc_3$+Bio_2	7.55	7.44	2.35	1.19	70.73	0.25	-	0.58	70.30	3.65	898	7.5	6.5	4.3	1.5

Nitrogen Fixing Bacteria

Data in table (5) indicate that the application of PVAc soil conditioner greatly increased the counts of N_2-fixing bacteria *Azotobacter* and *Asospirillum*. The rate of increase was depended up on the rate of PVAc application. For example, $PVAc_1$, $PVAc_2$ and $PVAc_3$ resulted in 1067%, 1233% and 983% increase over the control in *Azotobacter* counts after one month of application while the respective increment reached 692%, 817% and 650% after two months from application. However, it was 1344%, 1567% and 1233% in soil samples taken after harvesting sugar beet plants. On the other hand, a treating sugar beet seeds by biofertilizers resulted in increasing the *Azotobacter* counts by 1400 %and 1900 % due to Bio_1 and Bio_2 after one month from cultivation; and 942% and 1150 % after two months from cultivation; and 1900% and 2511% after harvesting sugar beet plants. The application of PVAc supported by biofertilizers affected favorably the *Azotobacter* counts as the highest counts (940 x 10^5 cfu/g dry soil) was associated with the combined treatment of ($PVAc_2$ +Bio_2) after harvesting. Such result was in agreement with those found by Hashem (1997) and El-Maghraby *et al*. (2000) who found that treating calcareous soil with 0.4 L/m^2 PVAc emphasized the role of (N+P) biofertilization on increasing the total count of N-fixing bacteria. Similar trends were also obtained in the *Azospirillium* counts due to the individuals and / or the combined treatments of PVAc and biofertilizers. The highest counts in such property (770 x 10^5 cfu/g dry soil) was attained with ($PVAc_2$ +Bio_2) after harvesting sugar beet plants. The favorable effect of PVAc on increasing the bacterial counts could be due to its influence on increasing the ability of the soil to hold water against evaporation, along with enhancing the management and distribution of water and air which means a better environmental conditions for increasing such microbial counts (Hashem and Wassif, 1997).

Phosphate Dissolving Bacteria (P.D.B.)

Data in table (5) show similar trends to those obtained for *Azotobacter* and *Azospirillium* either due to the rate of applied PVAc soil conditioner and / or type of biofertilization except that the highest counts obtained for phosphate dissolving bacterium were recorded in the soil samples obtained after two months from cultivation. For example, the individual treatments of $PVAc_1$, $PVAc_2$ and $PVAc_3$ increased the P.D.B. by 215%, 180% and 195 % over the control after one month of application while the respective increments reached 65%, 46% and 50 % after two months from application. However, it was 100%, 77% and 71 % in soil samples taken after harvesting sugar beet plants. On the other hand, the respective increment due to treating sugar beet seeds by the individual applications of biofertilizers Bio_1 and Bio_2 resulted in increasing the P.D.B. by 163% and 186 %, respectively after harvesting. Such results were confirmed by the combined applications of biofertilizers and PVAc soil conditioner as the combined application of

$PVAc_2$ plus Bio_2 resulted in greater counts of P.D.B. than those obtained when each applied singly. Generally the efficiency of the experimental treatments could be arranged in the following order: $PVAc_2+Bio_2$ > $PVAc_1+Bio_2$ > $PVAc_3+Bio_2$ > $PVAc_2+Bio_1$ > $PVAc_3+Bio_1$ > $PVAc_1+Bio_1$ > Bio_2 > Bio_1 > $PVAc_1$ >$PVAc_2$ > $PVAc_3$ > control after harvesting sugar beet plants.

TABLE (5). Effect of polyvinyl acetate (PVAc) and biofertilizers on microbiological activity in soil.

Treatments	After one month			After two months			After harvesting		
	Control	Bio_1	Bio_2	Control	Bio_1	Bio_2	Control	Bio_1	Bio_2
	1- *Azotobacter* counts (*10^5 cfu/g dry soil) (initial 3*10^5)								
Control	12	180	240	24	250	300	18	360	470
$PVAc_1$	140	270	450	190	440	560	260	630	720
$PVAc_2$	160	320	520	220	450	720	300	650	940
$PVAc_3$	130	250	280	180	400	400	240	560	650
2- *Azospirillum* counts (*10^5 cfu/g dry soil) (initial 20*10^5)									
Control	80	170	200	68	210	260	76	270	310
$PVAc_1$	140	280	380	180	370	570	240	520	700
$PVAc_2$	160	340	450	200	480	560	250	570	770
$PVAc_3$	120	260	340	170	300	460	210	410	560
3- Phosphate dissolving counts (*10^4 cfu/g dry soil) (initial *10^4)									
Control	20	80	107	48	100	120	35	92	100
$PVAc_1$	63	96	115	79	116	155	70	105	140
$PVAc_2$	56	100	124	70	135	152	62	120	148
$PVAc_3$	59	98	118	72	120	148	60	110	126
4- CO_2 evolution (mg/100g soil /24 hr) (initial 2)									
Control	3.3	9.2	9.9	4.5	13.6	14.0	5.9	19.2	21.0
$PVAc_1$	8.1	11.4	15.9	10.1	14.0	19.6	14.2	24.0	31.8
$PVAc_2$	8.5	12.5	17.0	12.2	18.7	21.2	16.4	28.2	36.0
$PVAc_3$	8.4	12.2	13.5	12.1	18.1	20.0	16.0	27.1	33.0

CO_2 Evolution

CO_2 evolution is a universal index used as a criterion for microbial activity, as the carbon mineralization pattern based on the values of CO_2 evolved from the soils amended with soil conditioners in combination with

biofertilizers (El Maghraby and Wassif, 1999). It is evident from table (5) that all of the experimental treatments enhanced CO_2 production. However, the amounting CO_2 yield found in the soil samples taken after harvesting sugar beet plants were higher than those found in the other two soil samples. This means that the CO_2 evolved from the conditioning soil increased with time. The application of $PVAc_2$ supported by Bio_2 gave the highest CO_2 production (36mg/100g soil/ 24 hr). Such results were stood in agreement with those obtained by Hashem (1987).

From the above-mentioned results it could be concluded that the application of PVAc individually or in combination with Bio_2 can be successfully used for improving calcareous soil properties as reducing soil pH and EC values; avoiding the hazard effects created by Na and Cl ions; increasing the availability of certain plant nutrients; improving the activity of soil microorganisms and increasing sugar beet yields. However, the combination of $PVAc_2$+Bio_2 (polyvinyl acetate at rate of 0.6 L /m^2 plus phosphate dissolving bacteria and nitrogen fixing bacteria) was the superior treatment in this respect.

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تأثير بعض الأسمدة الحيوية والتسميد المعدني على إنتاجية بنجر السكر تحت ظروف الري بمياه مالحة

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أقيمت تجربة حقلية فى محطة بحوث رأس سدر التابعة لمركز بحوث الصحراء خلال الموسم الشتوى ٢٠٠٠/٢٠٠١ بهدف دراسة أثر التداخل بين محسنات التربة الصناعية والتسميد الحيوى على خواص الأراضى الجيرية وإنتاجيتها من بنجر السكر النامى تحت ظروف الرى بمياه مالحة. اشتملت الدراسة على ١٢ معاملة مرتبة فى تصميم قطاعات كاملة العشوائية مع تكرار كل معاملة ٤ مرات وهى كما يلى:

أ- معاملات المحسنات: شملت ٤ معاملات من محسنات التربة الصناعية هى (بدون محسنات – بولى فينيل أسيتات ($PVAc_1$) بمعدل ٢,٥ لتر/ م٣ - بولى فينيل أسيتات ($PVAc_2$) بمعدل ٤,٥ لتر/ م٣ - بولى فينيل أسيتات ($PVAc_3$) بمعدل ٢,٥ لتر /م٣).

ب – معاملات التسميد الحيوى: شملت ٣ مستويات من التسميد الحيوى هى (بدون سماد حيوى - سماد حيوى فوسفاتى Bio_1 - خليط من السماد الحيوى النيتروجينى والفوسفاتى (Bio_2)

وقد أشارت النتائج المتحصل عليها إلى ما يلى:

أ- زيادة إنتاجية جذور وأوراق بنجر السكر زيادة معنوية بمعاملة التربة إما بالبولى فينيل أسيتات بصورة منفردة أو بصورة مجتمعة مع التسميد الحيوى . وكانت أعلى قيمة للمحصول (٢٥,٤ طن للفدان) فى المعاملة المركبة (فينيل أسيتات بمعدل ٤,٥ لتر /م٣ مع خليط من التسميد الحيوى النيتروجينى و الفوسفاتى). وقد أنعكس ذلك على زيادة محتوى الجذور والأوراق من عناصر النيتروجين والفوسفور والحديد والمنجنيز والزنك زيادات متفاوتة باختلاف معاملات الدراسة حيث كان للمعاملة المركبة المشار إليها الأثر الأكبر فى زيادة محتوى الجذور والأوراق من العناصر المذكورة .

ب- أدت معاملات الدراسة إلى انخفاض فى قيم pH التربة وملوحة التربة EC وكذلك تركيز الأيونات الذائبة Ca, Mg^{++}, K^{+}, Na^{+}, HCO_3^{-} and CL^{-} وكان للمعاملة المركبة ($PVAc_2$ & Bio_2) الأثر الأكبر فى خفض هذه القيم. وعلى العكس من ذلك أدت معاملات الدراسة خاصة المعاملة المركبة المشار إليها إلى زيادة تيسر عناصر النيتروجين والفوسفور والحديد والمنجنيز والزنك لجذور وأوراق بنجر السكر .

ج- حدوث زيادة فى أعداد البكتريا المثبتة للنيتروجين و المذيبة للفوسفات بالأضافة إلى زيادة انطلاق ثانى أكسيد الكربون وذلك فى عينات التربة المأخوذة من معاملات الدراسة المختلفة حيث كان للمعاملة المركبة ($PVAc_2$& Bio_2) الأثر الأكبر فى معظم الحالات لزيادة قيم الخواص المشار إليها وبالتالى تحسين خواص الأراضى الجيرية وزيادة إنتاجيتها من بنجر السكر تحت ظروف الرى بمياه ملحية.

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ON THE ECOLOGY AND PHYTOSOCIOLOGY OF EL-OMAYED AREA, EGYPT

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The average of density for 62 perennial species in five types of habitats was recorded. The highest density in coastal sand dune habitat was contributed by *Launaea resedifolia* while, in saline depression, inland plateau and ridge the highest account was recorded for *Salsola tetrandra, L. resedifolia, Scorzonera undulata*. The ridge habitat contributed the highest number of species (32 species) while the lowest number was attained in the non-saline depression (20 species). Sixty-two species belonging to 24 families were recorded. The highest contribution was presented by members belonging to family Compositae followed by Gramineae and Chenopodiaceae (15, 13 and 13%, respectively). On the community levels, the plant of inland ridge exhibited the highest abundance in terms of absolute density while plant community of the non-saline depression exhibited the lowest value.

Most perennial species exhibit their greatest phonological activity during winter and spring and were less active or dormant during autumn. However, some species particularly most shrubs and sub-shrubs, continue to be active throughout the whole year (e.g. *Deverra tortuosa, Helianthemum lippii*, and *Artemisia herba alba*). The most common life-forms were of the woody species (76%) which include 41% non-succulent leaves and 5% succulent leaves, while the contribution of herbs represented 25%, of which 5% were non-succulent leaves.

The tallest plants recorded during the growing season in the whole area were those of *Thymelaea hirsuta, Lycium shawii* and *Anabasis articulata* were among shrubby species and *Asphodelus ramosus* of the perennial herbs and the grass *Ammophila arenaria*. On the other hand, the sub-shrubs *Helianthemum lippii and H. kahiricum* were the shortest.

Some other human activities have more impact on the vegetation than the over grazing by livestock. The various

activities have different impacts on the plant diversity (e.g. 10 species of the recorded species were rated as endangered species due to human impact or desertification).

Positive significant correlation coefficients were found between soil depth and both abundance of ever-green shrubs with non succulent leaves and with herbs.

Keywords: observatory, human impact, desertification, ever-green succulent leaves species

El-Omayed observatory is a part of the northwestern Mediterranean coastal land of Egypt. It was located 80 km west of Alexandria in the form of transect which consists of a series of elongated ridges, alternating with depressions, running parallel to the Mediterranean coast in NE-SW direction.

The region is characterized by marked physiographic heterogeneity and different types of habitats, which leads to distinct local variations in the distribution of vegetation. It offers a wide spectrum of wild plant species in the range of 110-130 perennials and more than 75 annuals. The vegetation belongs to the "Steppic Eastern Africa Domain of the East Mediterranean sub-region" according to the classification of Quetzal (Abdel-Razik *et al*., 1996)

The study area is bounded by latitudes 30^{o} 27^{-} and 30^{o} 52^{-} N, and by longitudes 28^{o} 55^{-} and 29^{o} 20^{-}E. It extends for about 17.5 km from the sea shore inlandwards. Geomorphologically, the area is characterized by low relief and mild topography. The topography becomes higher in an irregular fashion from coast inland. The relief is characterized by successive undulations of calcareous rocky ridges (with altitudes of 10-70 m) running more or less parallel to the coastal line and are alternating with land depressions. Three distinct major physiographic features are recognized: a) a coastal system covering a small part of the territory and including the coastal sand dunes; b) ridges and depressions (saline and non-saline) system which constitutes the main part of the territory and c) the inland plateau system close the inland desert. The objective of this part of the study is to record seasonal changes in the vegetation and soil parameters of rangelands system.

MATERIALS AND METHODS

Fifteen plots have been carefully selected along a transect intersecting the observatory terrain. These plots were selected to represent the following main habitats: non-saline depression (sites I A,B and C; fenced "1" and unfenced "2", rocky ridge (sites II A and B), inland plateau (sites III A; fenced "1" and unfenced "2"), saline depression (sites IV A and B) and

coastal and sub-coastal dunes (sites V A, B, and C). Locations of these sites (layed within permanent sampling stands) were fixed in the observatory area.

The area of each sampling stand was 50 x 100 meters which was based on many considerations including the growth-form of the species, the homogeneity of the vegetation and the topography. In each stand, 50 quadrates, each 1x2 meters size, were sampled according to a fixed random distribution layout, then were marked metal permanent points. These plots were used for quantitative measures of vegetation.

A list of species present in an area can often provide interesting information, particularly if the list includes species which were poor colonists of disturbed areas. Accordingly, a floristic list of species present in each site was recorded each season. Absolute and relative density of each permanent species were calculated. Plant nomenclature was done according to Täkholm (1974) and were updated following Boulos (1995).

Soil description was carried out according to the terminology cited by the U.S. Soil Survey Staff (1975). In each site four sets of soil samples were collected, each set was represented by composite soil samples at three successive depths; 0-15, 15-30 and 30-45 cm. These soil samples were air dried, crushed and passed through 2mm sieve and subjected to the following determinations: particle size distribution was carried out by sieving for sandy soils and by pipette method for moderately textured soils. $CaCO_3$ was determined using Collin's calcimeter. Total soluble salts were determined in 1:2.5 soil water extract according to Richards (1954). Organic matter content was determined according to Walkely and Blak's method. Sodium and potassium was determined by flame photometer, calcium and magnesium were determined volumetrically using Versene method. Chloride was determined by titration with silver nitrate, while carbonate and bicarbonate were determined by titration with standard hydrochloric acid.

RESULTS

Table (1) shows the average of absolute density (individuals/100m^2) for 62 perennial species in the five types of habitats. The highest value of absolute density in the coastal sand dune habitat was contributed by *Launaea resedifolia* (412 ind./100m^2), while in saline depression, inland plateau and ridge the highest value was recorded by *Salsola tetrandra, L. resedifolia, Scorzonera undulata* (49, 242 and 168 ind./100m^2 respectively). The ridge habitat attained the highest contribution of species (32 species) while the lowest contribution was attained in the non-saline depression (20 species).

TABLE (1). Average absolute density (individual/100m^2) of species within the permenant plots in the different habitats of El-Omayed Observatory.

Habitat / Species	Coastal Sand Dune	Non Saline depression	Saline depression	Inland Plateau	Ridge
Aeluropus lagopoides (L.) Trin. ex Thwaites	64.7	0.0	0.0	0.0	0.0
Allium roseum Boiss.	0.7	0.0	0.0	0.5	0.9
Ammophila arenaria (L.) Link.	33.0	0.0	0.0	0.0	0.0
Anabasis articulata (Forssk.)Moq.	0.0	5.2	0.0	4.0	0.0
Anabasis oropediorum Maire	0.0	0.8	1.5	6.5	32.0
Arisarum vulgare Targ.	0.0	0.2	0.0	30.5	0.0
Artemisia herba-alba Asso	0.0	0.0	0.0	0.0	113.0
Artemisia monosperma Delile	0.0	227.7	0.0	0.0	0.0
Asparagus stipularis Forssk.	0.0	0.0	0.0	0.0	3.0
Asphodelus ramosus L.	0.3	43.5	6.5	203.5	56.5
Astragalus spinosus (Forssk.)Muschl.	0.0	0.0	0.5	0.0	0.0
Atractylis carduus (Forssk) C. Chr.	6.7	15.3	0.5	27.0	0.5
Carduncellus eriocephalus Boiss.	0.0	8.5	0.0	10.0	0.0
Crucianella maritima L.	138.7	0.0	0.0	0.0	0.0
Dactylis glomerata L.	0.0	0.0	0.0	0.0	24.0
Deverra tortuosa (Desf.)DC.	1.7	--	1.5	3.0	28.0
Ebenus armitagei Schweinf.and Taub.	0.0	0.0	0.0	0.0	3.0
Echinops spinosissmus Turra	44.0	0.5	0.0	13.0	18.0
Echiochilon fruticosum Desf.	0.0	14.3	0.0	126.5	0.0
Echium sericeum (Vahl) Klotz	8.0	0.0	0.0	0.0	0.0
Elymus farctus (Viv.)Runemark ex Melderis	20.0	0.0	0.0	0.0	0.0
Erodium glaucophyllum (L.) L' Her.	0.0	3.5	0.0	0.0	0.0
Erodium hirtum Willd.	0.0	0.2	0.0	5.5	14.0
Euphorbia hierosolymitana Boiss	0.0	0.0	0.0	0.0	0.5
Euphorbia paralias L.	2.7	0.0	0.0	0.0	0.0
Frankenia revoluta Forssk.	0.0	0.0	0.5	0.0	0.0
Gymnocrpos decandrum Forssk.	0.0	1.2	0.0	16.0	68.5
Helianthemum kahiricum Del	-	-	17.5	-	119.0
Helianthemum lippii (L.) Dum.	22.0	20.7	4.0	209.5	-
Herniaria hemistemon J. Gay.	-	-	0.5	-	1.0
Hyoseris radiata L.	2.0	-	-	-	-
Iris sisyrinchium L.	-	-	0.5	-	10.5
Kickxia aegyptiaca(L) Nabelek	-	-	1.0	-	0.5
Launaea nudicaulis (L.) Hook.	0.6	8.0	3.0	2.0	28.5

TABLE (1). Cont.

Habitat / Species	Coastal Sand Dune	Non Saline depression	Saline depression	Inland Plateau	Ridge
Launaea resedifolia (L.) Kuntze	411.7	13.7	-	242.0	-
Limoniastrum monopetalum (L.) Boiss.	-	-	37.0	-	-
Limonium tubiflorum (Delile) Kuntze	-	-	-	-	19.0
Lotus creticus L.	-	-	-	-	0.5
Lotus polyphyllos E.D. Clarke	38.3	-	-	-	-
Lycium shawii Roem and Schult.	0.3	0.7	-	5.0	1.5
Lygeum spartum Loefl ex L.	-	-	0.5	-	6.0
Noaea mucronata (Frossk.) Asch.and Schweinf.	0.0	12.0	0.0	33.5	57.5
Ononis vaginalis Vahl	63.0	-	-	-	-
Otanthus maritimus (L.) Hoffmanns and Link.	0.3	-	-	-	-
Pancratium maritimum L.	0.3	-	-	-	-
Phagnalon schweinfurthii Sch.	-	-	-	10.5	-
Phlomis floccosa D. Don.	-	-	-	-	0.5
Plantago albicans L.	1.0	2.0	25.0	123.0	--
Polygonum equisetiforme Sm.	4.3	-	-	-	-
Reaumuria hirtella Jaub. and Spach.	-	-	8.5	-	18.5
Salsola longifolia Forssk.	1.0	-	4.0	-	-
Salsola tetragona Delile	-	-	49.0	-	11.0
Salsola tetrandra Forssk.	-	-	22.0	-	-
Salvia aegyptiaca L.	9.0	-	0.5	-	-
Salvia lanigera Poir.	17.0	-	6.0	5.5	2.5
Scorzonera undulata Vahl.	-	-	21.0	18.5	168.0
Stipagrostis ciliata (Desf.) de Winter	-	1.7	-	5.0	1.0
Suaeda pruinosa Lange	0.3	-	17.0	-	-
Teucrium polium L.	-	-	-	-	3.0
Thymelaea hirsuta (L.) Endl.	1.7	0.2	-	14.0	3.0
Urginea undulata (Desf.) Steinh.	-	-	-	-	1.5
Zygophyllum album L.	3.0	-	-	-	-

Phenological phases, life-forms, families and presence percentage of plant species in the different habitats were represented in table (2). Sixty two species belonging to 24 families were recorded. The highest contribution was presented by members belonging to family Compositae followed by Gramineae and Chenopodiaceae (15, 13 and 13%, respectively). The most

common life-forms were the shrubby species (76%) which have 41% with non-succulent leaves and 5% with succulent leaves while the contribution of herbs represented 25% of which 5% has non-succulent leaves. The contribution of geophytes was 5%.

Phenophases of plant species in the 15 plots in different habitats during two seasons were presented in table (2). Most perennial species exhibit greater activity during winter and spring and were less active or dormant during autumn. However, some species, particularly most of the shrubs and sub-shrubs, continue survive throughout the year (e.g. *Deverra tortuosa, Helianthemum lippii*, *Artemisia herba -alba*). On the other hand, phenological records indicated that most of the species were in the dormant phase, while some of them start their vegetative activity. For example, the maximum vegetative growth of shrubby species was attained by those of the non-saline depression.

TABLE (2). Phenophase, life form and presence % of the plant species in the different habitats representing El-Omayed observatory during spring and autumn seasons (Ev=evergreen, Sh=Shrub, L.ns=Leafy non-succulent H=Herb, L.S=Leafy succulent, Ls.S=Leafless succulent, Ds=Deciduous, G=Geophyta ,Vg=vegetative growth, L.o=Leafing out, F.b=flower buds, Fl= flowering, Fr = fruiting, S.s=Seed shading, Dr=Dormancy and P=Presence)

Species	Family	Life form	Spring					Autumn					P%
			Non saline depression	Ridge	Inland Plateau	Saline depression	Sand dune	Non saline depression	Ridge	Inland Plateau	Saline depression	Sand dune	
Aeluropus lagopides	**Gramineae**	Herb	- -	- -	- -	- -	40Vg 60 Dr	- -	- -	- -	- -	40 Vg 50 Dr 10S.s	20
Ammophila arenaria	**Gramineae**	Herb	- -	- -	- -	- -	80 g 20F.b	- -	- -	- -	- -	17Vg 83 Dr	20
Anabasis articulata	Chenopodiaceae	Ev. Shrub	75Vg 25 Dr	45 Vg 55 Dr	45vg 55 Dr	34 Vg 66 Dr	- -	50 Vg 50 F.b	40 Vg 60 F.b	35 Vg 65F.b	- -	- -	60
Anabasis oropediorum	Chenopodiaceae	Ev. Shrub	39Vg 61 Dr	50Vg 50 Dr	45Vg 55 Dr	- -	- -	22 Fl 78Vg	60 Fl 40Vg	50 Fl 30Vg 20 Fr	- -	- -	60
Artemisia herba-alba	Compositae	Ev. Shrub	- -	50 Fr 50S.s	- -	- -	- -	- -	50 F.b 50Vg	- -	- -	- -	20

TABLE (2).Cont.

Artemisa monosperma	Compositae	Ev. Shrub	70 Fr 18S.s 12Vg	- -	- -	- -	- -	65 F.b 35Vg	- -	- -	- -	- -	20
Asparagus stipularis	Liliaceae	Ev. Shrub	- -	100Vg	- -	- -	- -	- -	30 Fr 70 Dr	- -	- -	- -	20
Asphodelus ramosus	Liliaceae	Herb	80 Dr 20 Fr	55 Dr 45 Fr	95Vg 5 F.b	80 Dr 20 S.s	- -	100 Dr	10L.o 90 Dr	15L.o 85Dr	100 Dr	- -	80
Astenatherum forsskaolii	Gramineae	Herb	- -	- -	- -	- -	- -	- -	30Vg 70 Dr	- -	- -	- -	20
Astragalus spinosus	Leguminosae	Ev. Shrub	- -	95 Vg 5 Fl	50L.o 50 Fr	100 Fr	- -	- -	100 Dr	100 Dr	40 Vg 60 Dr	- -	60
Atractylis carduus	**Compositae**	Sub Shrub	- -	- -	100 Vg	- -	- -	- -	- -	100 Dr	- -	- -	20
Carduncellus eriocephalus	Compositae	Herb	100 Vg	- -	- -	- -	- -	100 Dr	- -	- -	- -	- -	20
Colchicum ritchii	Liliaceae	Herb	- -	100 Vg	- -	- -	- -	- -	100 Dr	- -	- -	- -	20
Convolvulus lanatus	Convolvulaceae	Ev. Shrub	10 Fl	- -	- -	- -	20 Vg	- -	30 Vg	- -	- -	- -	40
Crucianella maritima	Rubiaceae	Ev. Shrub	- -	- -	- -	- -	- -	40F.b	- -	- -	- -	20Vg	20
Cynodon dactylon	Gramineae	Herb	- -	- -	- -	- -	- -	- -	- -	- -	- -	60Vg	20
Dactylis glomerata	Gramineae	Herb	- -	- -	90Vg 10Fr	- -	- -	- -	- -	10Vg 90Dr	- -	- -	20
Deverra tortuosa	Umbelliferae	Ev.Sh,L.ns.	70 Fr 20 F.b 10 Fl	20 Fr 80 Dr	-	80 Fr 20 Dr	-	70 Fl 30 Fr	85 Fl 15 Fr	20 Fl 80 Vg	20 Fl 80 Vg	20 Fl 80 Vg	100
Ebenus armitagei	Leguminosae	Ev. Shrub	- -	- -	65Vg 35Dr	- -	- -	- -	- -	10Vg 90Dr	- -	- -	20
Echinops spinosissmus	Compositae	Ev. Shrub	- -	60Vg 30L.o 10 Fl	80L.o 20 Fl	65 Vg 35 Dr	- -	65VG 35 Fb	100Dr	10 Vg 90 Dr	- -	10 Vg 90 Dr	80
Echiochilon fruitcosum	Boraginaceae	Ev. Shrub	- -	60Vg 40Fl	- -	60 F.b 40 Fl		30Vg 70Dr		60Vg 40 Dr	- -	- -	40
Echium sericeum	Boraginaceae	Herb	- -	- -	- -	- -	55VG 45 Fl	- -	- -	- -	- -	10 Fl 90 Vg	20
Elymis farctus	Gramineae	Ev. Shrub	80 Fl 20Vg	- -	- -	- -	100Vg	- -	- -	- -	- -	30Vg 70Dr	40
Euphorbia Hierosolymitana	Euphorbiaceae	Ev. Shrub	- -	15Fl	- -	- -	- -	- -	20Vg 80Dr	- -	- -	- -	20
Euphorbia paralias	Euphorbiaceae	Ev. Shrub	- -	- -	- -	- -	40Fr 60Fl	- -	- -	- -	- -	40Fr 60Dr	20
Frankenia revoluta	Frankeniacea	Ev. Shrub	- -	- -	- -	50Dr 50Fl	- -	- -	- -	- -	30Vg 70Dr	- -	20
Fumana thymifolia	Cistaceae	Ev. Shrub	- -	100S.s	- -	- -	- -	- -	10F.b 90Vg	- -	- -	- -	20
Globularia arapica	Globulariaceae	Ev. Shrub	- -	50Fl 50Vg	- -	- -	- -	- -	100Dr	- -	- -	- -	20

TABLE (2).Cont.

Gymnocarpos decandrum	Caryophyllaceae	Ev. Shrub	40Fr 40Fl 20 Vg	80Fl 20 Fr	70Fl 30Fr	20Fl 80Vg	- -	100 Dr	10L.o 90Dr	20L.o 80Dr	- -	- -	80
Helianthemum karhiricum	Cistaceae	Ev.Sh,L.ns.	-	25 Fl 75 Vg	-	60 Fr 40 Fl	-	-	25 Vg 75 Dr	-	-	-	40
Helianthemum lippii	Cistaceae	Ev.Sh.,L.ns	30 F.b 45 Vg 15 Fl 10 Fr	15 Fl 85 Vg	10 F.b 90 Vg	10 Fr 15 Fl 75 Vg	-	55 F.b 35 Fl 10 Fr	75 Vg 25 Fl	20 Fl 80 Vg	-	10 Fl 90 Vg	80
Hyoseris lucida	Compositae	H	-	-	-	-	53 F.b 47 Fl	-	-	-	-	-	20
Iris sysyrinchium	Iridaceae	H.,G.	-	-	-	-	-	-	100 Dr	-	-	-	20
Kickxia aegyptiaca	Scorophulariaceae	Ev.Sh,L.ns.	-	-	-	60 Fl 40 Vg	-	-	20 Vg 80 Dr	-	-	-	20
Launaea nudicaulis	Compositae	Ev.Sh,L.ns.	-	-	-	-	-	-	80 Fl 20 Vg	-	-	-	20
Limoniastrum monopetalum	Plumbaginaceae	Ev.Sh,L.ns.	-	-	-	67 Vg 33 Dr	-	-	-	-	50 Vg 50 Dr	-	20
Limonium tubiflorum	Plumbaginaceae	Ev.Sh,L.ns.	-	10 Fl 90 Vg	-	-	-	-	80 Fl 20 Vg	-	-	-	20
Lotus creticus	Leguminosae	Ev.Sh,L.ns.	-	-	-	-	-	100 Dr	-	-	-	-	20
Lotus Polyphyllos	Leguminosae	Ev.Sh,L.ns.	-	-	-	-	60 Fl 40 Fr	-	-	-	-	80 Vg 20 Dr	20
Lycium shawii	Solanaceae	Ev.Sh,L.ns.	80 Vg 20 Dr	95 Vg 5 Fl	5 Fr 95 Dr	35 Vg 65 Dr	-	60 Fl 40 Fr	20 F.b 80 Vg	20 Fl 80 Vg	-	-	80
Lygeum spartum	Gramineae	H.,G.	-	50 Vg 50 Dr	-	-	-	-	20 Vg 80 Dr	-	-	-	20
Noaea mucronata	Chenopodiaceae	Ev.Sh,L.ns.	48 Vg 29 L.o 23 F.b	55 Vg 45 L.o	60 Vg 40 Fl	-	-	60 Fl 40 Fr	15 Fl 85 Vg	30 Fl 70 Vg	-	-	60
Ononis vaginalis	Leguminosae	Ev.Sh,L.ns.	-	-	-	-	100 Fl	-	-	-	-	20 Vg 80 Dr	20
Otanthus maritimus	Compositae	Ev.Sh,L.ns.	-	-	-	-	-	-	-	-	-	10 Fl 90 Vg	20
Phagnalon schweinfurthii	Compositae	Ev.Sh,L.ns.	-	-	-	-	-	-	20 Vg 80 Dr	-	-	-	20
Phlomis fpoccosa	Labiatae	Ev.Sh,L.ns.	-	90 Fl 10 Vg	-	-	-	-	90 Fr 10 Dr	-	-	-	20
Plantago albicans	Plantaginaceae	Ev.Sh,L.ns.	-	-	100Vg	100Vg	-	15 Vg 85 Dr	-	20 Vg 80 Dr	-	-	40
Polygonum equisetiform	Polygonaceae	H.,L.ns.	-	-	-	-	100Vg	-	-	-	-	60 Fl 40 Vg	40
Reaumuria hirtella	Tamariaceae	Ev.Sh,L.ns.	-	80 Vg 20 Dr	-	80 Vg 20 Dr	-	25 Fr 75 Dr	-	40 Vg 60 Dr	-	-	40
Salsola longifolia	Chenopodiaceae	Ev.Sh.,L.S.	-	-	-	80 Vg 20 Dr	100Vg	-	-	-	30 Fl 70 Vg	-	40
Salsola tetragona	Chenopodiaceae	Ev.Sh.,L.S.	-	-	-	-	-	-	70 Vg 30 Dr	-	55 Vg 45 Fl	-	40
Salsola tetrandra	Chenopodiaceae	Ev.Sh,L.ns.	-	-	-	55 Vg 45 Dr	-	-	-	-	60 Vg 40 Fl	-	40
Salvia aegyptiaca	Labiatae	Ev.Sh,L.ns.	-	-	-	100 Fr	-	-	-	-	-	-	20
Salvia lanigera	Labiatae	Ev.Sh,L.ns.	-	70 Fl 30 Vg	-	80 Fr 20 Fl	90 Fr 10 Fl	-	-	-	-	100Dr	60
Scorzonera undulata	Compositae	H.,L.ns.,G.	-	100Vg	100Vg	100Vg	-	-	100 Dr	-	-	-	60
Stipagrostis ciliata	Gramineae	H.,L.ns.	60 Vg 40 Dr	-	40 Vg 60 Dr	-	-	-	10 Vg 90 Dr	-	-	-	40
Suaeda pruinosa	Chenopodiaceae	Ev.Sh,L.ns.	-	-	-	65 Vg 35 Dr	-	-	-	-	60 Vg 40 Dr	-	20
Suaeda vera	Chenopodiaceae	Ev.Sh,L.ns.	-	-	-	-	-	-	-	-	-	80 Fl 20 Vg	20
Teucrium polium	Labiatae	Ev.Sh,L.ns.	-	90 Vg 10 Fl	-	-	-	-	80 S.s 20 Fr	-	-	-	20
Thymelaea hirsuta	Thymelaeaceae	Ev.Sh,L.ns.	70 Fr 20 Vg 10 Fl	60 Fr 25 Vg 15 Fl	60 Fl 40 Fr	40 Fl 60 Vg	100 Fl	60 Vg 25 F.b 15 Fl	20 F.b 80 Vg	95F.b 5 Fl	-	80 Fl 20 Vg	100
Zygophyllum album	zygophyllaceae	Ev,Sh.,L.S.	-	-	-	-	55 Fr 45 Vg	-	-	-	-	75 Vg 25 Fr	20

The average height of different plant species recorded in the study ranges between 1 and 80 cm (Table 3). Although it varies widely in different sites and habitats, it depends to some extent on the life-forms of such species and sometimes varies with the phenological behavior of some species especially perennial herbs and grasses. The shruby species *Thymelaea hirsuta, Lycium shawii* and *Anabasis articulata*, the perennial herb *Asphodelus ramosus* and the grass *Ammophila arenaria* were the tallest

recorded plants in the growing season in the whole area. On the other hand, the sub-shrubs *Helianthemum lippii and H. kahiricum* were the shortest.

TABLE (3). Average height (upper figure, cm.) ± Standard Error (Lower figure) of the most common species in the different habitats of El-Omayed Observatory during spring and autumn.

Species	Spring					Autumn				
	Non saline depression	Ridge	Inland Plateau	Saline depression	Sand dune	Non saline depression	Ridge	Inland Plateau	Saline depression	Sand dune
Aeluropus Lagopoides	-	-	-	-	10.0 2.4	-	-	-	-	11.6 1.1
Ammophila arenaria	-	-	-	-	51.5 2.3	-	-	-	-	48.0 3.6
Anabasis articulata	41.2 5.7	14.0 5.0	28.0 3.6	12.0 4.4	-	32.0 4.1	29.5 2.1	23.9 3.7	-	-
Anabasis oropediorum	29.4 4.9	10.0 2.0	13.0 3.3	8.0 3.3	-	13.9 1.6	11.1 1.8	18.6 2.4	-	-
Artemisia herba-alba	-	-	-	-	-	-	20.5 2.2	-	-	-
Artemisia monosperma	30.5 8.2	-	-	-	-	42.7 2.7	-	-	-	-
Asphodelus ramosus	33.7 13.3	14.0	38.0 2.7	48.0 8.0	-	-	13.2 2.3	20.0 1.0	-	-
Asparagus stipularis	-	-	-	-	-	-	15.0 1.6	-	-	-
Astragalus spinosus	-	20.0 2.0	35.0 1.1	22.0 5.0	-	-	-	-	12.3 0.7	-
Atractylis Carduus	-	-	23.5	-	-	-	-	-	-	-
Convolvulus lanatus	-	-	-	-	-	11.4 1.2	-	13.4 1.7	-	-
Crucianella maritima	-	-	-	-	19.0 1.0	-	-	-	-	25.9 2.0
Dactylis glomerata	-	-	-	-	-	-	22.2 0.9	-	-	-
Deverra tortuosa	23.5 3.8	24.0 5.1	19 3.5	11.0 2.7	40.0	19.3 6.0	30.5 2.5	15.0 3.1	9.5 0.6	17.5 1.8
Ebenus armitagei	-	15.0 8.0	-	-	-	-	12.7 1.1	-	-	-
Echinops spinosissmus	7.0	15.0 8.0	21.0 2.8	-	23.0 4.0	18.3 1.9	16.0 3.8	5.0 0.7	-	18.5 2.3
Echiochilon fruitcosum	14.5 4.0	-	12.0 2.4	-	-	16.5 1.6	-	8.4 1.0	-	-
Echium sericeum	-	-	-	-	12.0 2.2	-	-	-	-	10.0 0.9
Elymis farctus	-	-	-	-	5.8 1.1	-	-	-	-	12.0 1.2
Euphorbia hierosolymitana	-	13.0 1.1	-	-	-	-	6.5 4.6	-	-	-
Euphorbia paralies	-	-	-	-	36.0 1.7	-	-	-	-	27.7 2.2
Frankenia revoluta	-	-	-	10.0	-	-	-	-	10.4 1.4	-

TABLE (3).Cont.

Globularia Arabica	-	-	-	-	-	-	8.0 1.4	-	-	-
Gymnocarpos decondrum	15.5 5.2	19.0 3.0	18.5 3.8	7.0 3.2	-	16.1 1.1	23.4 2.1	14.4 1.1	-	-
Helianthemum karhiricum	-	3.5 0.6	-	4.0 0.4	-	-	2.0 0.2	-	-	-
Helianthemum lippi	12.0 2.1	2.0 0.9	7.0 0.9	3.0 1.4	21.0 0.1	4.7 0.7	2.1 0.3	3.4 0.3	-	15.0 1.4
Hyoseris radiate	-	-	-	-	25.0	-	-	-	-	-
Gymnocarpos decondrum	15.5 5.2	19.0 3.0	18.5 3.8	7.0 3.2	-	16.1 1.1	23.4 2.1	14.4 1.1	-	-
Helianthemum karhiricum	-	3.5 0.6	-	4.0 0.4	-	-	2.0 0.2	-	-	-
Helianthemum lippi	12.0 2.1	2.0 0.9	7.0 0.9	3.0 1.4	21.0 0.1	4.7 0.7	2.1 0.3	3.4 0.3	-	15.0 1.4
Hyoseris radiate	-	-	-	-	25.0	-	-	-	-	-
Kickxia aegyptiaca	-	-	-	4.0 1.4	-	-	8.5 1.1	-	-	-
Launaea nudicaulis	-	-	-	-	20.0 2.6	-	-	-	-	-
Limoniastrum monopetalum	-	-	-	14.5 7.1	-	-	-	-	21.7 2.4	-
Limonium tubiflorum	-	-	-	12.0	-	-	4.2 0.5	-	-	-
Lotus polyphyllos	-	-	-	-	41.0 12.7	-	-	-	-	29.4 4.2
Lycium shawii	41.3 4.4	52.0 5.1	45.0 4.5	10.0 2.0	-	45.3 3.3	14.9 2.9	54.9 9.4	-	-
Lygeum spartum	-	-	-	-	-	-	17.8 3.4	-	-	-
Lygos raetam	-	-	-	-	-	-	-	-	-	80.0 15.0
Noaea mucronata	18.5 4.9	11.0 1.5	19.0 2.9	-	-	25.4 2.4	23.9 2.7	17.5 3.3	-	-
Ononis vaginalis	-	-	-	-	14.0 2.5	-	-	-	-	30.0 2.9
Otanthus maritimus	-	-	-	-	26.0 9.0	-	-	-	-	30.7 3.3
Phlomis floccose	-	67.0 4.1	-	-	-	-	66.4 3.2	-	-	-
Polygonum equisetiform	-	-	-	-	15.0	-	-	-	-	-
Prasium majus	-	-	-	-	-	-	12.0 1.0	-	-	-
Reaumuria hirtella	-	-	-	13.0 2.5	-	-	-	-	12.2 0.9	-
Salsola longifolia	-	-	-	10.5 3.5	58.0 6.7	-	-	-	10.9 1.8	-
Salsola tetragona	-	-	-	-	-	-	-	-	8.6 0.5	-
Salsola tetrandra	-	-	-	6.0 2.0	-	-	-	-	9.4 2.2	-
Salvia aegyptiaca	-	-	-	6.0 1.5	-	-	-	-	-	-
Salvia lanigera	-	-	-	7.0 2.0	11.5 1.4	-	-	-	-	9.3 1.4
Stipagrostis ciliate	8.5 1.7	-	15 0.1	-	-	-	46.4 3.4	22.0 9.8	-	-
Suaeda pruinosa	-	13.0 0.1	-	13.5 7.0	-	-	-	-	20.3 2.0	-
Thymelaea ahirsuta	59.3 11.3	47.5 5.3	80.5 3.7	35.0 5.0	75.0 6.5	64.8 7.9	53.5 8.5	76.1 6.9	-	66.0 9.0
Zygophyllum album	-	-	-	-	77.0	-	-	-	-	28.8 2.8

The average physical and chemical properties of the soil in different habitats of the study area were presented in table (4). The coarse particle was

found in the inland plateau at depth of 0- 15 cm followed by the saline depression at depth of 30- 45 cm. Clay particles ranged from 0.12 to 0.06 mm. It reached its highest percentage in the saline depression (22.9%) at the depth of 15-30 cm, followed by the non-saline depression (13.4%) at the depth of 0- 15 cm, while the maximum percentage of clay, was attained in the saline depression (7.5 and 5%) at depths of 30-45 cm and 15-30 cm , respectively.

The highest value of electric conductivity EC was attained in the saline depression. Remarkable variations in the EC were noticed at the same habitat. For example, in the non-saline depression EC value at 15 cm depth was 4.41 dsm^{-1} while, it was 5.0 dsm^{-1} at 30 – 45 cm depth. In the sand dunes, EC was 0.88 dsm^{-1} at 15 cm depth while it was 2.7 dsm^{-1} at 30-45 cm depth. No significant variations in pH (soil reaction) in all different habitats were found. The maximum concentration of Ca and Na were attained in the saline depression habitat with relative increase with depth in sand dune habitat. Mostly, all the anions reach its maximum value in the sand dunes followed by saline depression, while there was a reverse trend for HCO_3^- and SO_4^{--} with the notable increase in Cl, SO_4 and $CaCO_3$ (34.2 %, 21.3 % and 50.4 %, respectively).

Correlation between life-forms and soil properties at different depths in different habitats during the two sampling seasons (spring and autumn) were shown in table (5). Significantly positive correlations were found between soil depth and the abundance of both evergreen shrubs with non-succulent leaves and the herbs.

DISCUSSION

The present-day vegetation was the result of a complex interactive network of a large number of various factors (Le Houèrou , 1992).

1) Floristic factors: The flora was the result of geologic, paleoclimatic, paleogeographic history and biological evolution. This flora was a mixture of recent paleoartic and inherited palaeotropical elements (Quézel, 1976).

2) Climatic: The governing climatic factors were rainfall amount and distribution, drought stress, temperature and cold and the P/PET ratio (where P = annual precipitation and PET = potential evapotranspiration).

3) Edaphic: Geology,petrology, physiography, topography, hydrology, erosion, soil, water and nutrient budgets.

4) Anthropozoic activities: The pressure from animals on ecosystems.

TABLE (4). Average of physical and chemical properties of the soil in the different habitats of El-Omayed Observatory . ***(Soil depth in cm; a = 0-15 , b= 15-30 ,c = 30-45)***

Parameter / Soil Texure		Habitat / Soil depth	Non Saline depression	Ridge	Inland Plateau	Saline depression	Sand dune
Particle Size % (mm)	***2.0-1.0***	a	0.48	1.93	6.55	-	0.57
		b	1	-	2.55	4.57	0.54
		c	0.90	-	3.71	5.70	0.47
	1.0-0.5	a	4.94	18.52	21.39	-	27.49
		b	5.70	-	18.64	11.38	65.63
		c	6.036	-	12.56	11.95	31.29
	0.5-0.25	a	27.32	16.53	41.32	-	61.20
		b	52.38	-	56.81	17.72	22.04
		c	43.87	-	55.44	22.55	53.89
	0.25-0.12	a	51.71	48.96	23.57	-	8.50
		b	32.65	-	15.18	38.48	6.26
		c	36.95	-	20.94	34.08	13.01
	0.12-0.06	a	13.4	10.94	5.17	-	0.97
		b	7.28	-	4.81	22.90	0.20
		c	10.24	-	4.01	18.12	0.43
	< 0.06	a	2.08	4.29	2.26	-	1.29
		b	1.35	-	1.96	4.98	5.56
		c	1.95	-	1.67	7.51	0.88
EC. (ds m^{-1})		a	0.34	0.20	0.23	4.41	2.4
		b	0.43	-	0.24	4.04	2.65
		c	0.29	-	0.28	4.95	3.12
PH		a	8.55	8.7	8.65	8.4	8.2
		b	7.13	-	8.65	8.4	8.26
		c	8.61	-	8.7	8.4	8.25
Ca^{++}		a	1.45	0.82	0.98	22.5	10.66
		b	1.65	-	1.11	20.65	12.16
		c	1.4	-	1.30	23.3	14.16
Mg^{++}		a	0.32	0.24	0.28	10.2	8.42
		b	0.37	-	0.34	9.38	13.14
		c	0.31	-	0.4	10.55	15.6
Na^{+}		a	0.89	0.66	0.75	13.05	7.6
		b	1.01	-	0.86	11.9	12.86
		c	0.873	-	1.03	13.5	15
K^{+}		a	0.033	0.04	0.04	0.95	0.65
		b	0.03	-	0.04	0.86	0.74
		C	0.02	-	0.04	0.9	0.83
Cl^{-}		A	1.29	0.8	094	21.2	15.6
		B	1.46	-	1.08	19.4	17.83
		C	1.23	-	1.28	21.95	34.16
HCO_3^{-}		A	0.18	0.18	0.21	3.39	2.53
		B	0.20	-	0.24	3.1	2.87
		C	0.17	-	0.28	3.5	3.34
So_4^{--}		A	6.39	0.86	0.95	21.9	16.1
		B	7.65	-	1.02	20	18.26
		C	5.99	-	1.23	22.65	21.26
$Ca\ CO_3$ %		A	28.48	24.4	23.3	25.75	49.6
		B	28.71	-	24.6	24.75	49.46
		C	28.68	-	22.5	23.85	50.4
O.M%		A	0.25	0.10	0.16	0.40	0.06
		b	0.21	-	0.15	0.41	0.07
		c	0.17	-	0.19	0.25	0.09

TABLE (5a). Simple correlation coefficient (r) between life-forms and soil properties during autumn

Soil texture	Life form / Soil depth	Herb	Ever green (Ev.Shrub)	Sub Shrub	Ev.Sh L.ns	H.G	H.L.ns
2.0-1.0	a		+	++		+	++
	b			+	+		+
	c	++		+	+		+
1.0-0.5	a	++		+		+	+
	b	++					
	c	++		+			+
0.5-0.25	a			+			+
	b	+		++			++
	c			+			+
0.25-0.12	a		++			++	
	b				+		
	c						
0.12-0.06	a		++				
	b				++	+	
	c				+		
< 0.06	a						
	b	+			+		
	c				++		
EC.(ds m^{-1})	a				++		
	b				++		
	c				++		
PH	a		++	+			+
	b	+		+		++	+
	c	+		+			+
Ca++	a				++		
	b				++		
	c				++		
Mg++	a	+			+		
	b	+			+		
	c	+			+		
Na+	a				++		
	b	+			+		
	c	+			+		
K+	a	+			++		
	b	+			+		
	c	+			+		
Cl^-	a	+			++		
	b	+			+		
	c	++			+		
HCO_3^-	a	+			++		
	b	+			+		
	c	+			+		
So_4^{--}	a	+			+		
	b	+			+		
	c	+			+		
$CaCO_3$%	a	++					
	b	++					
	c	++					
O.M%	a				++		
	b				+		
	c			+	+		+

+ and ++: Denote significance at 0.05 and 0.01 levels of probability, respectively.
Ev=Evergreen, Sh=Shrub, L.ns=Leafy non-succulent, H=herb and G=Geophyta

TABLE (5b). Simple correlation coefficient (r) between life-forms and soil properties during spring

Soil texture	Life form / Soil depth	Herb	Ever green (Ev.Shrub)	Sub Shrub	Ev.Sh L.ns	H.G	H.L.ns
2.0-1.0	a		+	++		+	
	b			+	+		
	c	++		+	+		
1.0-0.5	a	++		+		+	++
	b	++					+
	c	++		+			
0.5-0.25	a			+			+
	b	+		++			
	c			+			
0.25-0.12	a		++			++	+
	b				+		
	c						
0.12-0.06	a		++				+
	b				++	+	
	c				+		
< 0.06	a						
	b	+			+		
	c				++		
EC.(ds m^{-1})	a				++		
	b				++		
	c				++		
PH	a		++	+			+
	b	+		+		++	
	c	+		+			
Ca++	a				++		
	b				++		
	c				++		
Mg++	a	+			+		
	b	+			+		
	c	+			+		
Na+	a				++		
	b	+			+		
	c	+			+		
K+	a	+			++		
	b	+			+		
	c	+			+		
Cl^-	a	+			++		
	b	+			+		
	c	++			+		
HCO_3^-	a	+			++		
	b	+			+		
	c	+			+		
So_4^{--}	a	+			+		
	b	+			+		
	c	+			+		
$CaCO_3$%	a	++					+
	b	++					
	c	++					
O.M%	a				++		
	b				+		
	c			+	+		

+ and ++: Denote significance at 0.05 and 0.01 levels of probability, respectively.
H=herb, G=Geophyta and L.ns=Leafy non-succulent

A considerable proportion of all ecological work in the past and to some extent at the present has been directed towards the description of vegetation. The object of such description was to enable ecologists to build a

mental picture of an area and its vegetation and allow the comparison and ultimate classification of the different units of vegetation.

Detailed description of the stratification of vegetation and the measurement of height of the abundant species form an important part in the understanding and recording of the vegetation structure (Kershaw, 1985). In desert ecosystems of the western Mediterranean coastal land of Egypt, the stratification of the vegetation has not been long recognized as one of its characteristic features. This may be due to the fact that the variation of species height between and within habitats were not remarkable (Le Houèrou 1991; Abdel-Razik *et al*. ,1996). Generally, there was no notable effect of fencing on plant species height in the new fenced area. But the most striking observation in this area was that *Aspodelus ramosus* always exhibit a notably lower height in the freely grazed sites as compared with that in the protected sites. Meanwhile, through the long field observation extended for several years in different habitats with different grazing pressures, there were obvious variations in height of the perennial range species as a result of different grazing pressures.

Results of the present study demonstrated clearly the importance of soil salinity and $CaCO_3$ on vegetation composition. Zahran *et al*. (1990); Shaltout and Sharaf El-Din (1988) recognized these soil factors together with moisture availability as the most critical factors determining the type of vegetation as well as its richness in other areas. Highly significant correlations were found between soil salinity (EC) and $CaCO_3$ content. The most affected life-forms were those of the evergreen shrubs and herbs during autumn and spring. The positive relationships obtained were also in agreement with the results of Sheng *et al.* (1994) where soil pH, soil structure and soil humidity were the main acting factors controlling the pattern and distribution of weed community in Huoqui Country of China. Variations in abundance measurements, density (individual m^{-2}) in the different habitats and for the different life-forms of the community are presented in table (6)

TABLE (6). Measurements of abundance in different habitats.

Habitat	Herbs	Sub-shrub	Shrub	Community
Coastal dunes	184	298	2.6	484.6
Non-saline depression	77.7	275.9	6.9	360.5
Saline depression	66	143.5	18.5	228
Inland plateau	40.2	409.5	29.5	479.2
Ridge	353	411.5	36.5	801

The plant community under study was composed of 51 herbs, 49 sub-shrubs and 17 shrubs. Besides spatial variations in the vegetation composition of the plant communities, the composition of life-forms reflects the response of vegetation to variations in certain environmental factor. In this respect, chamaephytes represent the most abundant life-form and

attained the maximum figures in the study area, while the geophytes attained the minimum. At the community level, (integrating the data from the life-forms) plant community of the ridge habitat exhibited the highest abundance in terms of absolute density while the lowest one was exhibited by plant community of the non-saline depression. However, the abundance of woody species (sub-shrubs and shrubs) was the highest followed by that of herbs. On the other hand, shrubby species showed the lowest abundance at the community level as well as the habitat level.

The impact of man was a dominant factor in arid environments of the world. In particular, the desert of the Middle East have been affected by human activities for thousand of years (Zohary, 1973). The percentages of different land use type at Omayed was summarized by Kamal (1996) in table (7).

TABLE (7). The percentage of different land use at Omayed region.

Land use type					
Rangeland		Cereal cultivation		Orchard plantation	
area					
Hectare	Percentage	Hectare	Percentage	Hectare	Percentage
4039.5	80.9	272.5	5.4	661	13.3

It was obvious that overgrazing and eradication of woody species were the dominant land use types. Heneidy (1992) and Heneidy and El-Darier (1995) at Omayed area recorded that the human activities (e.g. clearing and wood cutting of natural vegetation) were more effective on the vegetation than over grazing by livestock. The various activities have different impacts. Generally, crop expansion, overgrazing, and firewood collection were the most harmful and were responsible for 80 % or more of the havoc (Le Houèrou and Gillet, 1990). In the observatory, 10 species rated as endangered species due to human impact or desertification (Abdel Razik *et al.,* 1996) were listed in table (8).

TABLE (8). The probable causes of some endangered species at Omayed region.

Species	Probable cause of endangered
Ebenus armitagei	Desertification
Echium sericeum	Pressure of man
Euphorbia hierosolynitana	Desertification
Euphorbia paralias	Human activity
Kickxia aegyptiaca	Desertification
Otanthus maritimus	Human impact
Pancratium maritimum	Human impact
Salsola tetragona	Human impact
Scorzonera undulata	Human activity
Urginea undulata	Human activity

There were direct and indirect causes for ecosystem degradation and species impoverishment in the study area. The direct causes were related mainly to the ways in which man has used and misused the natural resources since its early history. More recent, land use activities were even more devastating (Ayyad, 1973). Evaluation of the effects of the environmental factors threatening the wild life should be also taken in consideration. Many of the range land species in the present study area were highly palatable particularly dwarf species (Abdel-Razik *et al*., 1988a,b and Heneidy, 1992). On the other hand, Heneidy and Bidak (1998) recorded that many of species in the coastal region especially the palatable ones will be threatened with continuing the overgrazing. Depending on the status of the range conditions and human impact in the study area most of the recorded species in the present study could be classified as a good pasture and have multipurpose uses but required careful management throughout the year.

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دراسة بيئية - نباتية لمنطقة الأميد - مصر

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سجلت الدراسةĒĎ نوعا نباتيا معمرا فى خمس موائل مختلفة من خلال تقدير الكثافة المطلقة (فرد/Čمتر^{Ď}) وتنتمى الى ĎĐ عائلة نباتية وكانت أكثر العائلات مشاركة هى المركبة يليها النجيلية ثم الزربيحية وقد سجل نبات *Launaea resedifolia* أعلىكثافة فى حل الكثبان الرملية (ĎčĐ فرد /ČČمتر^{Ď}) بينما سجل نبات *Salsola tetragona* أعلى كثافة (Đě فرد/ČČمتر^{Ď}) فى حل المنخفضات الملحية و نبات *Launaea resedifolia* (ĐĎ فرد/ČČ متر^{Ď}) فى حل الهضبة الداخلية و كذلك نبات *Scorzonera undulata* (čĒĚ فرد / ČČ متر^{Ď}) فى حل الحدبة الداخلية .

أظهرت الدراسة أن معظم الأنواع المعمرة تسجل أعلى نشاط من الناحية المظهرية فى موسمىالشتاء و الربيع وأقل نشاط فى فصلى الخريف و الصيف الا إن بعض الأنواع تستمر فى نشاطها طوال العام مثل نباتات *Deverra tortuosa, Helialthemum lippii, Artemisia herba-alba* وأثبتت الدراسة إن نمط الحياة السائد للانواع المعمرة الخشبية (%ēĒ) و التى تشمل النباتات ذات الأوراق الغير عصيرية (%ĐČ) وتلك ذات الأوراق العصيرية (%đ) تليها الأنواع المعمرة العشبية (%ĎđĎ) و(%đ) اوراق عصيرية . وقد سجل أكبر عدد من الأنواع النباتية و كذلك الوفرة(đĎ نوع) فى حل الحدبة الداخلية وأقل عدد ووفرة فى حل المنخفض الغير ملحى .

وقد استهدفت الدراسة ايضا قياس التباين فى ارتفاع النبات مع اختلاف الموائل واتضح إن بعض الأنواع المعمرة الخشبية مثل نباتات *Thymelaea hirsuta, Lycium shawii, Anabasis articulata* والأنواع الأخرى العشبية مثل نباتات *Ammophila arenaria and Asphodelus ramosus,* هى أكثر الأنواع أرتفاعا خلال العام فى موسم نموها . وكانت الأنواع الأقل ارتفاعا هى *Helianthemum lippii and H. kahiricum*. وقد خلصت الدراسة الى إن النشاط البشرى هو أكثر العوامل البيئيةالمؤثرة فى الموائل المختلفة وبدورها على الأنواع النباتية مقارنة بالعوامل الأخرى مثل الرعى وخلافة ، مما يساهم فى إختفاء و ندرة بعض الأنواع النباتية ذات الأهمية البيئية و الأقتصادية . و أثبتت الدراسة إن هناك علاقة معنوية بين نمط الحياة لبعض الأنواع النباتية وبعض عوامل التربة وعمقها و خصوصا للأنواع الخشبية ذات الأوراق الغير عصيرية.

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THE EFFECT OF NATURAL SOIL CONDITIONERS ON CALCAREOUS SOIL PROPERTIES AND BARLEY PRODUCTION UNDER SALINE CONDITIONS

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A field experiment was carried out with barley crop during 1999/2000 growing season at Maryout Station of Desert Research Center. The applied treatments were: control, farmyard manure (FYM) at the rates of 10, 20 and 30 tons/ha and town refuse (T.R.) rates of 10, 20 and 30 tons/ha. The experimental design was based on completely randomized blocks with four replicates. All treatments received N and P fertilizers with rates of 167.5 Kg N/ha and 37.5 P_2O_5/ha, respectively.

The results indicated that the best treatments arranged in the following order: 30 tons FYM/ha, 20 tons FYM/ha > 30 tons T.R./ha. These values were 5.31tons/ha, 5.04 tons/ha and 4.85 tons/ha, respectively. The plant content from K^+, Cu^{++} and Na^+ was the highest in case of 20 tons FYM/ha, while the highest values of Fe^{++} and Zn^{++} were in case of 30 tons T.R./ha. These are due to the high content of soil conditioners. The highest value of Mn^+ content was in case of 10 tons FYM/ha. This brought about a low yield in this treatment. EC and ESP values after harvesting were the highest in case of 20 and 30 tons T.R/ha.

Keywords : farmyard manure, town refuse, calcareous soil, barley, saline condition, micronutrient Fe, Mn, Zn and Cu; Maryout research station.

The limiting factor for horizontal extension in desert areas is available water resources. The insufficient water supplies level to use less water quality for irrigation, using such water is accompanied by salinization process which cause soil degradation. In this respect, soil conditioners application is necessary and vital to face such problem and increasing crop production. In Egypt, calcareous soils represent 25% of the new reclaimed area. Because of the limiting water supply, the need of expanding agricultural land had led to

the use of saline water in irrigation which caused soil deterioration in some areas.

Abdel-Salam *et al*. (1983) found that the yield was decreased under saline water irrigation while improved by organic manure application. The highest yield was obtained on normal soil receiving organic manure at 25 tons/ha level and irrigated with saline water (3000 ppm). Also, El-Sibaie *et al*. (1983) found that barley yield was positively affected by organic manure treatment and negatively by salinity levels. They added that, the best yield was obtained when normal soil was treated with organic manure of 25 tons/ha and irrigated with 6000 ppm saline water. Similar results on wheat were obtained by Bhapal (1989) and Raza *et al*. (1989). El-Tony *et al*.(1990) studied the effect of different organic manures, i.e. clover straw, sheep waste and town refuse on dry matter production of wheat crops. They reported that dry matter production of wheat plant was positively related with manuring and negatively with water salinity. However, they added that sheep waste and clover straw were more effective than town refuse. Under high salinity of water and calcareous soil, Khalil *et al*. (1991) reported that the increase in the grain and straw yield of wheat was accompanied with the organic wastes which improve the water use efficiency. Wassif *et al*. (1995) studied the effect of some soil amendments on production of wheat under saline irrigation water. They found that the magnitude of increase over the control treatment quantity reached 20.9, 38.4 and 27.9% for straw, grain and straw plus grain yields, respectively. Dahiya *et al*. (1987) and Jarecki *et al*. (1991) observed that the application of Farm yard manure (FYM) increased the concentration of N, P and K of maize and wheat plants. Similar trend was obtained by Sakr *et al*. (1992) on wheat under salinity condition.

Ibrahim *et al*. (1986) showed that significant increase in Fe, Mn and Zn concentrations herb and pea plants were attained with organic substances compared to unfertilized control. With respect to the electrical conductivity, Hamdi *et al*. (1968) stated that the applications of saline water containing 2 g/L of different salts decreased EC of the soil extract (Clay loam) to different degrees. Sharma and Ball (1975) showed that the effect of irrigation with saline water was more pronounced on sandy loam soil than clay loam one.

Abdel-Hamied *et al*. (1991) found that Diethyline triamine penta acidic acid (DTPA) extractable Cu and Zn ranged from 0.8-2 and 1.4-3.8 ppm, respectively, in salt affected soils.

Yousry *et al*. (1984) found that the addition of poultry manure to three soil types increased the electrical conductivity greater than 7 dS/m.

The aim of the present investigation was to study the effect of natural soil conditioners on controlling salinity hazard and barley yield as well as some soil properties after harvesting.

MATERIALS AND METHODS

The field experiment was carried out at Maryout Station of Desert Research Center. The soil analysis of the experimental sit is presented in table (1).

TABLE (1). Soil physical and chemical properties.

Soil texture	$CaCO_3$ %	pH	EC dS/m	Ca	Mg	Na	K	HCO_3	Cl	SO_4	C.EC meq/ 100g	ESP %
				meq/L								
Clay loam	27	8.04	5.86	14.79	15.79	32.6	2.05	12.0	18.0	34.0	29.27	8.52

The experiment studied the effect of natural soil conditioners on soil properties and barley yield. The applied treatments consisted of two natural soil conditioners, each type was applied at 4 levels 0, 10, 20 and 30 tons/ha. The experiment was conducted in a completely randomized block design with four replicates for each treatment. The site was divided into 42 m^2. All treatments received 167.5 Kg N/ha as NH_4NO_3 and 37.5 Kg P_2O_5/ha as superphosphate fertilizers.

Barley was sown at the rate of 100 Kg/ha in 2/12 (1999) in the experimental plots, the saline water (2000 ppm) was applied at intervals of 10 days using surface irrigation. The applied water has pH 8.22, EC 3.32 dS/m, soluble Ca^{++} 9 meq/L, Mg^{++} 9 meq/L, Na^{+} 16.08 meq/L, K^{+} 0.51 meq/L HCO_3^{-} 5 meq/L, Cl^{-} 19 meq/L and $SO_4^{=}$ 9.3 meq/L. FYM has N 1.55%, C/N 14.83, EC 34.9 dS/m and water holding capacity 180%. Town refuse has N 1.48%, C/N 12.23, EC 33.5 dS/m and water holding capacity 100%. After harvesting, surface soil samples (0-30cm) were taken from each treatment and prepared for determination of Fe^{++}, Mn^{++}, Zn^{++} and Cu^{++} in DTPA extractant. After maturity of the yield grains and straw were recorded and statistically analysed according to Snedecor and Cochran (1967). Thereafter plant samples were wet ashed with HNO_3; $HClO_4$: H_2SO_4.10: 4:1 respectively according to Van Schowenburg (1968) and determined Fe, Mn, Zn, Cu, K and Na.

RESULTS AND DISCUSSION

The values of barley yield as affected by different levels of Farmyard manure and town refuse are given in tables (2 and 3).

Regarding the FYM, all rates were significantly increased the yield of grains and straw. Apparently the best rate of FYM is 30 ton /ha, where the yield is 5.31 ton/ha and 8.89 ton/ha for grains and straw, respectively. From the economic point of view the rate of 20 tons FYM/ha was the best, where the grains and straw were 5.04 tons/fed and 8.925 tons/ha, respectively. This is owing to the enhancing of water use efficiency.

Concerning the town refuse (TR) effect, all rates were significantly increased the grains yield, while the straw yield significantly decreased compared to the control yield.

TABLE (2). The effect of natural soil conditioners on grain yield of barley (Ton/ha.)

Type of soil conditioners	FYM			T.R.		
Treat. Control	10	20	30	10	20	30
3.43	3.52	5.04	5.31	4.28	4.78	4.85

L.S.D. $_{0.05}$ = 0.70 **L.S.D.$_{0.01}$ = 0.98**

TABLE (3). The effect of natural soil conditioners on straw yield of barley (Ton/ha).

Type of soil conditioners	FYM			T.R.		
Treat. Control	10	20	30	10	20	30
7	7.41	8.93	8.89	4.91	5	5.19

L.S.D. $_{0.05}$ = 0.85 **L.S.D. $_{0.01}$ = 1.19**

Table (4) shows that the high content of Fe in barley grains was obtained from town refuse treatments. This is owing to the high content of iron in TR (table 4), while the highest value of Mn was in FYM at the rate of 10 ton/ha. This is due to the high content of Mn in FYM, also the few yield in this treatment. While this value decreased in other treatments because of the dilution effect. The zinc content in barley grains was high in different treatments as compared with control treatment. This was true for either FYM or TR. The copper content of barley-grains was high for the rate of 20 tons/ha of FYM and the rate of 30 tons/ha. It is apparently for the available of Cu. DTPA in FYM. Similar result was obtained in case of potassium and sodium content. On the other hand, these results are because of the EC which is high for FYM (34.9 dS/m) and TR (33.5 dS/m). Moreover, these values do not represent the fact because of the different acid content.

TABLE (4). Mineral content of barley grains as affected by soil conditioners.

elements / Treatments	Fe ug/g	Mn ug/g	Zn ug/g	Cu ug/g	K^+ mg/g	Na mg/g
Control	161	39	33	5.25	5	1.3
FYM 10 tons/ha.	176	57	42	5.50	5.9	1.4
FYM 20 tons/ha..	195	26	39	7.00	7.0	1.7
FYM 30 tons/ha..	188	30	38	6.5	5.3	1.6
T.R. 10 tons/ha.	208	35	39	3.75	5.3	1.4
T.R. 20 tons/ha.	219	30	40	5.00	5.2	1.2
T.R. 30 tons/ha.	355	49	43	4.00	5.4	1.5
FYM	3509	218	55	9	12	16.0
TR	4624	151	445	125	3.5	18.2

FYM=Farmyard manure
TR=Town refuse

Table(5) shows that the EC of soil samples after harvesting decreased through different FYM treatments relative to the initial soil EC (5.86 dS/m). In this respect, the EC values in case of FYM treatments at the rates of 10, 20 and 30 ton/ha were3.66, 4.26 and 4.28 dS/m, respectively.

TABLE (5). Soil analysis after harvesting.

Treatments	EC (dS/m)	ESP	Ex. K^+ (meq/100g)
Control	3.70	8.9	1.03
FYM 10 tons/ha	3.66	9.22	0.92
FYM 20 tons/ha.	4.26	9.80	1.03
FYM 30 tons/ha	4.28	9.80	0.97
TR 10 tons/ha.	4.73	11.00	1.03
TR 20 tons/ha.	6.08	14.86	0.92
TR 30 tons/ha	5.87	16.60	1.03

FYM=Farmyard manure
TR=Town refuse

TABLE (6). Available micronutrients of soil after harvesting as affected by natural soil conditioners application.

Micronutrient ppm / *Treatments*	Fe^{++} ug/g	Mn^{++} ug/g	Zn^{++} ug/g	Cu^{++} ug/g
Control	3.22	2.32	0.80	0.98
FYM 10 tons/ha	2.54	3.66	0.42	0.50
FYM 20 tons/ha	2.86	3.93	1.27	0.56
FYM 30 tons/ha	2.28	4.80	0.91	0.46
TR 10 tons/ha.	2.40	5.17	0.79	0.32
TR 20 tons/ha.	3.52	8.28	1.29	0.26
TR 30 tons/ha	3.26	6.93	0.81	0.38
FYM TR	46.4 1373	40.9 75.1	19.04 28.76	2.44 5.84

FYM=Farmyard manure
TR=Town refuse

On the other hand, TR treatments caused a slight increase in soil EC after harvesting. Generally, the FYM is better than the TR The ESP increased in case of TR more than FYM. This is owing to the high content of sodium in TR.

Table (6) showed that the highest contents of Fe, Mn, Zn and Cu were in case of Town refuse.The best treatments were FYM 20 and 30 tons/ha

concerning barley grains and straw. The low content for most elements in the case of the high yield. This fact due to the dilution effect. From the economic point of view the rate of 20 ton FYM per hectare was the best treatment.

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تأثير محسنات التربة الطبيعية على صفات الأرز الجيزية الإنتاجية محصولة تحت الشروط الملحية

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أجريت تجربة حقلية خلال موسم ٢٠٠٠/٢٠٠١ فى محطة بحوث مريوط التابعة لمركز بحوث الصحراء واستخدم فيها نوعين من المحسنات الطبيعية هى مخلفات المزرعة ومخلفات المدن بمعدلات(٢٥،٥٠،١٠٠ طن /هكتار) ، (٢٥،٥٠،١٠٠ طن /هكتار) على الترتيب فى تصميم قطاعات كاملة العشوائية مع ٣ مكررات لكل معاملة اضيف السماد النتروجينى والفوسفورى بمعدلات ٤٨ كجم ن/هكتار،٢٤ كجم فوسفور أ /هكتار) .

اظهرت النتائج أن ترتيب المعاملات من حيث كفاءتها كانت كالتالى :- ٢٥طن مخلفات المزرعة> ١٠٠ طن مخلفات المزرعة > ٢٥ طن مخلفات مدن وهذه القيم كانت كالتالى ٢٤ وفوسفور ٤٨ طن /هكتار على الترتيب. محتوى النبات من البوتاسيوم والنحاس والصوديوم كان الأعلى فى حالة ١٠٠ طن مخلفات المزرعة للهكتار بينما كان الحديد والزنك اعلى فى حالة ٢٥طن مخلفات مدن للهكتار. والنتيجة السابقة تعزى الى محتوى المحسنات العالى من تلك العناصر ، وكانت القيمة الأعلى للمنجنيز فى حالة ١٠٠طن مخلفات مزرعة للهكتار وهذا يرجع إلى الإنتاجية القليلة.

أظهرت التحاليل الكيماوية للتربة بعد الحصاد أن درجة التوصيل الكهربى والنسبة المئوية للصوديوم المتبادل كانت عالية فى حالة(١٠٠ طن /هكتار) مخلفات مدن وقد أدت إضافة مخلفات المدن إلى زيادة التوصيل الكهربى والنسبة المئوية للصوديوم المتبادل بينما على العكس من ذلك أدت إضافة مخلفات المزرعة الى نقص هذه القيم فى كل معدلات الإضافة من سماد المزرعة ونستخلص من ذلك أن مخلفات المزرعة كانت الأفضل فى تأثيرها على خواص التربة الجيرية ولقد تحقق أقصى عائد صافى من معاملة(١٠٠ طن/هكتار) مخلفات مزرعة وقد كانت نسبة المنفعة الى التكاليف ٢.٤.

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EFFECT OF N_2-FIXING BACTERIA AND ACTINOMYCETES AS BIOFERTILIZERS ON GROWTH AND YIELD OF CUCUMBERS IN SANDY SOILS IN EGYPT

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A greenhouse experiment was carried out to study the effect of inoculation with the most active strains of *Azotobacter, Azospirillum* and *Streptomyces* on the total microbial counts, growth parameters of cucumbers, disease severity pre and post emergence damping off and survival of the plants.

Generally, inoculation with these strains increased the soil microbial activities, decreased the harmful effect of *Rhizoctonia solani* on both microbial and growth parameter of cucumbers (plant height, root length, fresh and dry weight, number of flowers and fruits, weight of fruits, chlorophyll content and nitrogen and protein percent in fruits).

Streptomyces lydicus (N_{cul}) gave the highest reduction in disease severity pre and post emergence damping off but *Azotobacter chroococcum* (R_f) and *Azospirillum lypoferum* (K_{cul}) gave the highest effect on the improvement of the growth parameter and survival of cucumber plants.

The used strains as a tri mixture also exhibited high reduction of disease severity together with an increase of the growth and yield of the plants.

Keywords: *azotobacter chroococcum, azospirillum lipoferum, streptomyces lydicus, rhizoctonia solani,* root-rot, damping off.

Desert soils are generally poor in their organic matter content which serves as a source of energy for the development of microorganisms and supplying them with essential nutrients (Bear, 1965 and Ishac*, et al.,* 1986 b).

In Egypt, plant production is carried out in reclaimed soils, particularly in sandy soils which suffer from structural, nutritional problems, water scarcity and alkaline pH values. The use of organic manure can improve such soils. Also, much attention was given to biofertilizer

technology for increasing agricultural production in order to limit the use of chemical fertilizers and the pollution. In particular seed inoculation by different types of bacteria has been discussed (Abd El-Ghany, 1994 and Hassouna, *et al.,* 1998).

Micro organisms that colonize roots are ideal as biocontrol agent of soil borne disease (Nemme, *et al,.* 1996 and Schloter and Hartmann, 1998).

Biofertilization techniques either by single or mixture of N_2-fixing bacteria, led to maximize the count and activity of such microorgansims for organic decay and mineralization, which is essential for nutrient availability for plants which inturn enhances plant growth in desert soil (Vlassak and Reynders, 1980 and Abd El-Ghany, 1994 and 1996).

Actinomycetes also act as a biofertilizer agent and soils treated with *Streptomyces* showed better development of cucumber, with plants healthier in appearance and higher in fruit yield compared with controls (Turhan, 1981 b and Tahvonen and Avikainen, 1990).

The objective of this study is to evaluate the effect of rhizospheric microorganisms as biofertilizers on the growth and yield of cucumbers grown in sandy soils.

MATERIALS AND METHODS

The experiment had been done in pots under greenhouse conditions in the year 2000 at Desert Research Center, Cairo, by using sandy soil as described in table (1) (Richards, 1954). Sheep manure as organic fertilizer was mixed with the experimental soil month before cultivation at the rate of 1.0 % (100 g pot^{-1}).

TABLE (1). The analysis data of the applied soil and organic manure.

Treatment	Depth (cm)			Coarse sand		Fine Sand	Silt			Clay	soil texture		
	0-15			59.00%		40.00%	0.57%			0.43%	Sandy		
10th Ramadan soil	pH	E.C mmohs/cm	O.M.%	O.C.%	T.N.%	C/N ratio	Cation meq$^{1/L}$				Anion meq$^{1/L}$			
							Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{-}	HCO_3^{-}	Cl	So_4^{--}
	7.6	1.7	0.09	0.052	0.014	3.7	5.7	1.8	9.8	0.7	0.0	3.4	11.4	3.1
Organic Manure	7.8	-	29.82	17.23	1.32	13.0	Moisture content % 29							

E.C. = Electric conductivity. O.M. = Organic matter.
O.C. = Organic carbon. T.N. = Total nitrogen.

For each treatment, 12 pottery pots (40cm diameter) were filled with 10 kg air dried sheep manured soil. Superphosphate (15.5%P_2O_5) was applied at the rate of 150 Kg/fed (1.5 g pot^{-1}). All treatments received the same rates of N and K fertilizers at the rates of 300 Kg N/fed (39 pot^{-1}) in the form of NH_4NO_3 (33.5% N) at 3 equal doses after 15, 30 and 50 days of sowing. Potassium was added at the rate of 100 Kg K_2SO_4 / fed (19 pot^{-1}) before flowering stage.

The fungal inoculum *(Rhizoctonia solani)* isolated from rotted roots of cucumber plants was added to the soil at the rate of 5% (500 g pot^{-1}). The infected soil was watered and mixed thoroughly for two weeks before cultivation to ensure growth and distribution of the inoculant fungus. Control pots were treated with the same amounts of sterilized sandy soil water medium without fungal inoculation.

Fresh liquid culture of pure local strain of either *Azotobacter chrococcum, Azospirillum lipoferum* or *Streptomyces lydicus* isolated from rhizosphere of different plants at different localities, purified and identified according to Bergy's Manual (1974 and 1984) was used as a biofertilizer in the form of single strain, or mixture of two or three strains at the rate of $\simeq 10^8$ colony forming unit (cfu)/ml. Cucumber seeds provided from Agriculture Research Center (cuccumis stivus – Pathandra f. Hybrid Japan) were washed and immersed for 30 minutes in liquid culture of the tested bacteria and actinomycetes as mentioned before. C.M.C. (0.5%) was used as an adhesive agents. Seeds were then dried at 30°C for two hours.

A number of ten treated cucumber seeds were sown in each pot and also untreated seeds sown by the same manner and used as control. After seedling, each pot was thinned later into 5 seedlings. Pots were directly irrigated to provide a suitable moisture for *inocula*.

Treatments under this study can be summarized as follows:

I- Uninoculated and uninfected soil (control)

Treatments and uninfected soil

1- *Azospirillum lipoferum* K_{cl} with the capacity of N_2- fixation (133 ppm).
2- *Azotobacter chrococcum* R_f with efficiency of N_2- fixation (210 ppm).
3- Mixture of 1 +2.
4- *Streptomyces lydicus* N_{cul}
5- Mixture of 1 +4.
6- Mixture of 2+4.
7- Mixture of 1 + 2+ 4.

II- Uninoculated and infected soil with *Rhizoctonia solani* (control).

All previous treatments (1-7) were applied with soil infected with *R. solani.*

The same treatments were made in plastic cups (10 cm diagmeter) to record the percentage of pre - and post - emergence damping off and number of survival plants 30 days after planting.

Microbial analysis of the soil and morphological characteristics of cucumber plants were determined at intervals of 30, 50, 70 and 90 days of planting, these periods represent vegetating, flowering, fruiting and harvesting stages of plant growth, respectively.

Microbial Counts

Modified Ashby's, semi solid malate and starch nitrate media were used for isolation of *Azotobacter, Azospirillum* and *Streptomyces.* isolates respectively from rhizosphere samples collected at different stages of plant growth to determine their densities for cucumber plants.

Disease Severity Index (DSI)

It was determined using the formula applied by Meshram and Jager (1983).

Parameters Measured of Cucumber Plants

- Shoot and root length (cm plant^{-1}).
- Fresh weight of shoots and roots (gm/plant^{-1}).
- Dry weight of shoots and roots were recorded after oven drying at 70^{o}C until reaching a constant weight following Black *et al*. (1965).
- Number of flowers and fruits per plant.
- Fruit fresh weight.
- Chlorophyll content was measured with a Minolta chlorophyll meter (SPAD-502) to determine the total chlorophyll in fresh leaves.
- Total nitrogen and total protein percentage of fruit were measured by the application of the Kjeldahl method as described by Jackson (1958).

Statistical Analysis

Data were subjected to statistical analysis using the method described by Snedecor (1966). The least significant difference (LSD) was used to differentiate means (Waller and Duncan, 1969).

RESULTS

Total Microbial Counts

It was observed from the results given in table (2) that the microbial count increased gradually towards the fruiting stage then decreased at harvesting stage of cucumber plant. Inoculation with biofertilizer agents individual or in a mixture di - or tri - stimulated the microbial growth in both infected and uninfected cultivated sandy soil to a considerable extents. The highest total microbial count was noticed in inoculated treatment with a bacterial mixture in uninfected and infected soil being 276, 240 x 10^4 cfu/gm dry soil, respectively comparing with controls being 128, 112 x 10^4 cfu/gm dry soil at fruiting growth stage, respectively.

TABLE (2). Effect of inoculation with biofertilizer agents and infection with *R. solani* on total microbial counts *(Azotobacter, Azospirillum and Streptomyces)* in the rhizosphere of cucumber plants (counts x 10^4 CFU g^{-1} dry soil).

Bioferltlizer agents	Stages of plant growth							
	vegetating		flowering		fruiting		harvesting	
	uninfec.	infected	uninfec.	infected	uninfec.	infected	uninfec.	infected
Control*	77	70	108	100	128	112	118	106
Azospirillum	130	90	136	120	160	148	148	134
Azotobacter	124	94	152	128	188	180	170	154
Azospirillum* + *Azotobacter	188	162	180	174	276	288	227	201
Streptomyces	133	96	148	118	152	140	150	129
Azospirillum* + *Streptomyces	152	148	176	154	232	200	204	177
Azotobacter* + *Streptomyces	140	113	177.2	140	192	148	184.6	144
*Mixture***	192	180	240	196	276	240	258	218

* Control : Uninoculated
** Mixture *: Azotobacter + Azospirillum + Streptomyces.*

Effect of Biofertilizer Agents on Disease Severity Index (DSI) of Cucumber Plants Infected with *R. Solani*

The results obtained from table (3) show that the highest reduction for DSI was giving by *Streptomyces lydicus* (55.5%) followed by *Azospirillum lipoferum* 61.1 and *Azotobacter chroococcum* (63.8%). For *Azotobacter* + *Azospirillum* , the reduction of DSI was 58.3%. Addition of *Streptomyces* strain to *Azotobacter* or *Azospirillum* singly or in a mixture decreased DSI between 52 – 50% (Fig. 1).

TABLE (3). Effect of inoculation with biofertilizer agents and infection with *R. solani* on the disease severity index (%) of cucumber plants.

Biofertilizer agents	#DSI (%)	
	Value	% of control
Control*	75	100
Azospirillum	61.1	81.4
Azotobacter	63.8	85
Azospirillum + *Azotobacter*	58.3	77.7
Streptomyces	55.5	74
Azospirillum + Streptomyces	50	66.6
Azotobacter + Streptomyces	52	69.3
*Mixture***	50	66.6

*Control : Uninoculated
**Mixture *: Azotobacter + Azospirillum + Streptomyces.*
#DSI : Disease severity index.

Fig. (1). Effect of inoculation with a biocontrol agents on the cucumber plant infected with *R. solani*

Effect of Inoculation on Percentage of Pre - and Post- Emergence Damping off and Survival Plant

The obtained results from table (4) proved that *R. solania* gave the highest pre- and post- emergence damping off (60 and 20%, respectively) and the lowest survival plants (20%). Biofertilization with N_2-fixers individual or as a mixture with *Streptomyces lydicus* strains reduced the harmful effect of the pathogenic fungus on cucumber plants by reducing the pre - and post - emergence damping off, root rot diseases to reach the lowest value of zero and 20% and increase survival plant to 60-70% compared to control.

TABLE (4). Effect of inoculation with biofertilizer agents and infection with *R. solani* on the percentage of pre - and post - emergence damping off and survival of cucumber plants.

Biofertilizer agents	Pre-emergence damping off	Post- emergence damping off	Survival plants
Control*	60	20	20
Azospirillum	20	30	50
Azotobacter	50	10	40
Azospirillum + Azotobacter	20	30	50
Streptomyces	40	5	55
Azospirillum + Streptomyces	10	20	70
Azotobacter + Streptomyces	20	20	60
Mixture*	20	10	70

*Control : Uninoculated

**Mixture *: Azotobacter + Azospirillum + Streptomyces.*

Plant Characteristics

Shoot and root length

The obtained results in table (5) indicated that the effect of *R. solani* can be significantly reduced by inoculation. Treated cucumber plants with mixed inoculation generally produced significantly higher length of shoot and root followed by *Azotobacter* and *Azospirillum* and the lowest with *Streptomyces.* The maximum root length was obtained at harvesting stage of plant growth.

TABLE (5). Statistical mean effects of stages, infection with *R. solani* and inoculation with biofertilizer agents on shoot and root length of cucumber plants.

Factors		Shoot Length	Root Length
Stages	Vegetative	32.939 d	15.764 d
	Flowering	69.604 c	21.818 c
	Fruiting	94.710 b	28.412 b
	Harvesting	119.995 a	34.268 a
Uninfected	Control	68.583 g	20.291 fg
	Azospirillum	83.925 de	26.533 cd
	Azotobacter	85.133 d	27.916 cd
	Azospirillum + Azotobacter	99.633 b	30.133 b
	Streptomyces	73.425 f	26.316 d
	Azospirillum + Streptomyces Azotobacter	97.658 b	30.608 b
	+ Streptomyces Mixture	92. 091 c	28.141 c
		103.99 a	33.308 a
Infected	Control	55.016 i	15.875 h
	Azospirillum	65.175 gh	20.5 f
	Azotobacter	66. 757 gh	20.991 f
	Azospirillum + Azotobacter	80.716 e	26.708 cd
	Streptomyces	63.6 h	18.783 g
	Azospirillum + Streptomyces Azotobacter	76.3 f	24.541e
	+ Streptomyces Mixture	74.116 f	23.041 e
		83.058 de	26.736 cd

Mean representing the effect of each factor on a particular parameter and not followed by the same letter are significantly different by Duncan's multiple range test ($P < 0.05$).

Shoot and root weight

Data in table (6) showed that shoot and root fresh or dry weights significantly increased towards harvesting stage of plant growth. Application of biofertilizer agents (especially mixed of *Azotobacter* and *Azospirillum)* significantly reduces the negative effect of *R. solani* on plant growth. These treatments recorded significantly the highest weights and the lowest ones with the single inoculation.

Flowering and fruiting

The results given in table (7) obviously revealed that inoculation with a mixture of the studied strains increased cucumber flowers and fruits number in uninfected soil comparing with infected one 54.6 and 39.3 flowers/plant and 22.7 and 16 fruits/ plant. Data showed the positive effect

of such organisms as biofertilizers on number of flowers and fruits of cucumber plants in the same time.

TABLE (6). Statistical mean effects of stages, infection with *R. solani* and inoculation with biofertilizer agents on fresh and dry weight of shoot and root of cucumber plants.

Factors		Shoot F.W.	Shoot D. W.	Root F.W.	Root D. W.
Stages	Vegetative	11.077d	1.140 d	2.344 d	0.451d
	Flowering	23.947c	2.564 c	3.129 c	0.563 c
	Fruiting	29.258b	3.025 b	3.739 b	0.689 b
	Harvesting	34.802a	3.507 a	4.364 a	0.822 a
Uninfected	Control	20.558 gh	2.205 ij	2.916 f	0.501 h
	Azospirillum	25.633 e	2.522 efg	3.466 de	0.628 ef
	Azotobacter	25.991e	2.667 e	3.358 e	0.695 d
	Azospirillum + Azotobacter	32.95 a	3.340 b	4.408 ab	0.843 ab
	Streptomyces	22.618 f	2.246 ij	3.219 e	0.565 g
	Azospirillum + Streptomyces	31.358 b	3.155c	4.25 b	0.801 bc
	Azotobacter + Streptomyces	28.891 c	2.951 d	3.808 c	0.780 c
	Mixture	34.091 a	3.599 a	4.641 a	0.895a
Infected	Control	16.417 I	1.725 l	2.202 h	0.365 j
	Azospirillum	19.791 h	2.12 jk	2.651 fg	0.487 h
	Azotobacter	21.2 g	2.304 hij	2.657 fg	0.466 hi
	Azospirillum + Azotobacter	25.391 e	2.583 ef	3.675 cd	0.674 def
	Streptomyces	19.725 h	1.993 k	3.275 e	0.420 I
	Azospirillum + Streptomyces	22.875 f	2.481 fgh	3.275 e	0.641 def
	Azotobacter + Streptomyces	21.358 g	2.372 ghi	2.608 g	0.625 f
	Mixture	27.291 d	2.692 e	3.758 c	0.685 de

Mean representing the effect of each factor on a particular Parameter and not followed by the same letter are significantly different by Duncan's multiple range test ($P < 0.05$).
D.W.= Dry Weight
F.W. = Fresh Wieght

For cucumber fruit weight, the lowest one was 83.9 gm in control infected soil significantly increased to 201.6 gm using a mixture of such organisms. For the uninfected one, the fresh weight significantly increased from 165.2 gm to 297.3 gm in control and using a mixture biofertilizer treatment, respectivley. Weight of fruits significantly decreased under single inoculation as indicated in table (7).

Chlorophyll content

Chlorophyll contents in fresh leaves were determined at different stages of cucumber plant growth (Table 8). The highest chlorophyll content was at flowering stage in uninfected soil (47.9%) using a mixture of inoculation but the lowest one was 44% with *Streptomyces* inoculation comparing with control (35.6%) but infected control soil was 33.3%.

TABLE (7). Effect of inoculation with biofertilizer agents and infection with *R. solani* on the number of flowers, fruits and weight of fruits of cucumber plants.

Biofertilizer angents	Number of flowers Plant^{-1}		Number of fruits Plant^{-1}		Weight of fruits Plant^{-1} (g)	
	uninfected	infected	uninfected	infected	uninfected	infected
Control	35f	52.2 g	14de	7.3 f	165.2 e	83.9 f
Azospirillum	42.3bc	33.3 f	20.3 b	13.3 e	243.6 be	155.6 e
Azotobacter	43b	34 f	20b	13.2 e	246 cd	153 e
Azospirillum + *Azotobacter*	54.5a	39 cde	22.6a	15.7 cd	289.2 a	188.5 de
Streptomyces	41.3 bc	33.3f	17 c	13.2 e	212.5 cd	158.4 de
Azospirillum* + *Streptomyces	52a	36.9def	22ab	14.6 de	286 a	185.4 de
Azotobacter* + *Streptomyces	43 bc	35.3ef	20 b	14.3 de	264 ab	180 de
Mixture	54.6a	39.3cd	22.7 a	16 cd	297.3a	201.6 d
L.S.D. 0.05	3.89		1.909		32.561	

Total nitrogen and total protein of fruits

It is obvious from the data presented in table (9) that biofertilizer agents singly or as a mixture significantly increased total N and total protein comparing with control and reduced the negative effect of *R. solani.*

The highest total N and protein of cucumber fruits cultivated in uninfested soil treated with mixture strains were 1.52 and 9.5% but the lowest ones were 1.18 and 7.37% with *Streptomyces* inoculation as compared with controls (1.15 and 7.18%) for total N and protein, respectively.

In contrast, in infected soil, total N and total protein percentages decreased to 1.4 and 8.75% in a mixture treatment comparing with control infected soil (0.09 and 6.87%) and the lowest effect was 1.1 and 6.25% under *Streptomyces* inoculation, respectively.

DISCUSSION

Root rot and damping off diseases are considered to be one of the most dangerous problems facing cucumber growers due to the great damage of infecting seedlings.

In this work, application of biofertilizer was conducted with cucumber in order to control such diseases and improve the growth and production.

The obtained results proved that N_2-fixers *Azotobacter chroococcum* and *Azospirillum lipoferum* and *Streptomyces lydicus* strains significantly reduced the harmful effects of the pathogenic fungus *(Rhizoctonia solani)* on cucumber plant and disease severity of infected plant. The highest significant

reduction in disease severity was obtained in the presence of *Streptomyces lydicus* and also the survival plant increased more than those treated with *Azotobacter chroococcum* and / or *Azospirillum lipoferum* or as a mixture. In this respect, Song *et al.* (1998) and Chamberlain and Crawford (1999) reported that *Streptomyces* sp. produced antibiotics which controlled root-rot diseases caused by *R-solani*. Also, Kundu and Nandi (1984) stated that the reduction of damping off caused by *R. solani* with *Streptomyces arenae* and *Streptomyces chibaensis* is due to increase population of the *Streptomyces* spp. leading to lower population of *R. solani.*

TABLE (8). Many effects of stages, infection with *R. solani* and inoculation with biofertilizer agents on total chlorophyll content of cucumber plants.

Factors		Total Chloorophyll content
Stages	Vegetative	37.170 bc
	Flowering	41.112 a
	Fruiting	38.2b
	Harvesting	35.869 c
Uninfected	Control	34.016 f
	Azospirillum	41.925 ab
	Azotobacter	41.658 ab
	Azospirillum + Azotobacter	40.908 abc
	Streptomyces	38.616 cd
	Azospirillum + Streptomyces	41.791 ab
	Azotobacter + Streptomyces	41.794 ab
	Mixture	43.791 a
Infected	Control	29.875 g
	Azospirillum	25.075 ef
	Azotobacter	36.233 def
	Azospirillum + Azotobacter	37.141 de
	Streptomyces	36.975 def
	Azospirillum + Streptomyces	34.55 ef
	Azotobacter + Streptomyces	36.175 def
	Mixture	38.88 bcd

Mean representing the effect of each factor on a particular parameter and not followed by the same letter are significantly different by Duncan's multiple range test ($P < 0.05$).

TABLE (9). Effect of inoculation with biofertilizer agents and infection with *R. solani* on the total nitrogen and total protein percentage of fruits cucumber plants.

Biofertilizer agents	Total N% of fruits		Total protein % of fruits	
	uninfected	infected	uninfected	infected
Control	1.15 fgh	1 h	7.18 fgh	7.25 h
Azospirillum	1.47 ab	1.22 efg	9.18 ab	7.62 efg
Azotobacter	1.3 def	1.26 efg	8.12 def	7.87 efg
Azospirillum + Azotobacter	1.5 ab	1.4 cde	9.37 ab	8.75 cde
Streptomyces	1.18 fgh	1.1 gh	7.37 fgh	6.87 gh
Azospirillum + Streptomyces	1.42 bcd	1.36 def	8.87 bcd	8.5 def
Azotobacter + Streptomyces	1.47 ab	1.16 fgh	9.18 ab	7.25 fgh
Mixture	1.52 a	1.4 cde	9.5 a	8.75 cde
L.S.D. 0.05	0.2113		1.312	

With respect to the microbial count, the results showed that the rhizospheric organisms increased during plant growth reach its maximum at flowering stage, then decreased towards harvesting. This may be due to the shortage of biological nitrogen during the maturity stage of plant growth these results were in agreement with that obtained by Nelson (1983).

The results also exhibited that "biofertilizers biocontrol agents" protect plants from the pathogen infection to different extents and in the same time shows a considerable increase in plant growth and yields e.g. plant height, root length, fresh and dry weight, number of flowers and fruits and weight of fruits, chlorophyll content, nitrogen and protein percent at vegetative, flowering, fruiting and harvesting stages of the plant growth. These results are in line with the finding of Tahvonen (1988) who found that seed treatment with powdery preparation of *Streptomyces* not only control root diseases but also increase yield of cucumber and carnation (10 – 30%).

The positive influence of N_2-fixers (*Azotobacter* and *Azospirillum*) on plant development can be atributed not only to the N_2-fixation process but also to the production of growth promoting substances and the production of antifungal antibiotics (Chet *et al.* 1990 and Kloepper 1992).

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تأثير البادئات الميكروبية المختبرة للنترجين والمحسنات الميكروبية على نمو وإنتاجية نبات الخيار فى التربة الصحراوية فى مصر

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تم إجراء تجربة أصص تحت ظروف الصوبة لدراسة تأثير التلقيح بسلالات ذات كفاءة عالية من جنس *الأزوتوباكتر* وجنس *الأزوسبيريللم* وجنس *الأستربتوميسس* على العدد الكلى للميكروبات، الأجزاء المختلفة للنبات وشدة الأصابة بمرض التعفن الجذرى وكذلك الأعداد السليمة للنبات.

وبصفة عامة كان لاستخدام هذه العزلات فى معاملة بذور الخيار تأثيرا واضحاً على زيادة أعداد الميكروبات المستخدمة وذلك فى منطقة الريزوسفير للنبات خلال مراحل نموه المختلفة وكذلك تحسناً واضحاً فى نمو النبات وإنتاجيته حيث كان هناك زيادة ملحوظة فى طول النبات والجذر والوزن الجاف والرطب للساق والجذر ونسبة الكلوروفيل فى الأوراق وعدد الأزهار والثمار لكل نبات وأوراق الثمار لكل نبات وكذلك نسبة محتوى النتروجين والبروتين فى الثمار وفى نفس الوقت أدت إلى خفض تأثير الفطر الممرض (*الريزوكتونيا سولانى*) على النبات وزيادة اعداد النباتات السليمة.

أعطى التلقيح بعزلة *الأستربتوميسس لايديكس* N_{cul} أعلى انخفاضا فى شدة المرض بينما عزلتى *الأزوتوباكتر كروكوكم* R_f و*الأزوسبيريللم ليبوفيرم* K_c أعلى تأثيراً على تحسن نمو وإنتاجية النبات وزيادة أعداده السليمة.

اظهر المخلوط الثلاثى من السلالات المستخدمة أيضا تأثيراً عالياً فى خفض شدة الأصابة بالمرض وفى نفس الوقت زيادة واضحة فى نمو وإنتاجية النبات.

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RESPONSE OF TOMATO ROOTS GROWTH TO SOME SALINE IRRIGATION WATER MANAGEMENT PRACTICES

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The present work intends to evaluate the influence of salinity, manner and application system of irrigation water on soil salinity and root growth of Super Marmande tomato cultivar. The experiment was carried out in the Agricultural Experimental Station of the Desert Research Center in Ras Sudr city located in South Sinai Governorate. The soil of such area is loamy sand, saline – non alkali. Water management practices include continuous application of water having either high (14.64dS/m) or low (7.16 dS/m) concentration, as well alternating or blending both types. Also, three systems of irrigation water viz; drip, subsurface drip and furrow were studied with influence on root length and tips. The results showed the following:

1) Drip irrigation was superior than other irrigation systems in alleviating salinity build up in the two soil layers under study. Higher salinity built up under furrow irrigation compared to the other systems. However, the practices of half amount of high salinity water followed by similar amount of low salinity water in each irrigation as well as the cyclic application resulted in the lowest salinity build up in the two studied layers of the soil profile. On the contrary, continuous application of irrigation water, resulted in relatively high salt accumulation in soil profile compared with the cyclic application.
2) Subsurface drip caused greater root length and proliferation as compared to other application systems. The cycling application of different water qualities attenuated the build up of high soil salinity and thus enhanced the root growth and proliferation.

Keywords: irrigation system, application of water salinity, root length, root tips.

In Egypt and many other parts of the world, water is the ultimate limiting factor for the agricultural expansion. Under such condition, i.e. limited supply of good-quality water and increasing demand by the overwhelming population, agriculture is forced to use more and more marginal quality water, either brackish or treated sewage effluent. Egypt has already in use about 5 billion m^3 of drainage and under ground water (Abu-Zeid, 1988). In the costal zones of Egypt aquifer is often subject to sea water intrusion, which affects the quality of water in the wells. Another risky condition, can be found in these cases that wells are located close enough to saline water underlying fresh water thereby over pumping can make such water intrude on the fresh one (Saad, 1982).In this context, many recommendations, and management practices were activated to facilitate the successful use of different water qualities. Among these are the sequential application of good and poor water quality (Rhoades, 1989), selection of the appropriate irrigation frequency and irrigation system (Meiri, 1989) and the selection of crops according with their tolerance to water quality, soil condition and the prevailing climate (Hamdy, 1990). The previous studies on the crop-salinity relationships have been based exclusively on the above ground or marketable crop yield (Maas 1990). Nevertheless, it may be important to evaluate the relationship between salinity and root growth. Therefore, the current work intends to evaluate the influence of water salinity management and application system on soil salinity and root growth of tomato "Super Marmande cultivar".

MATERIALS AND METHODS

This study was performed in the Agricultural Experiment Station of the Desert Research Center (DRC) in Ras Sudr City located on the Eastern Coast of Suez Gulf, South Sinai Governorate. The soil has a loamy sand texture throughout the 0 – 60 cm depth, with 87.8% sand, 7.7% silt and 4.5% clay. In such experiment, two water wells were drilled; water electrical conductivity in the first is 7.16 dS/m and the second is 14.64 dS/m. To minimize the amount of water extracted from the low salinity well and to maximize the utilization of high salinity water, the experiment was designed to include the following treatments;

Five strategies of water applications namely : 1) Irrigation with water having 14.64 dS/m (T_1) , 2) Irrigation with water having 7.16 dS/m (T_2), 3) Alternative in the coarse of each irrigation high salinity water and low salinity water in the rate of 1:1 (T_3) , 4) Cyclic application of T_1 and T_2 (T_4) and 5) Applying mixed water from the (T_1 & T_2) at a ratio of 1 : 2.

Three types of irrigation methods, viz., drip (D) ,subsurface drip (SD) and furrow (F). In all cases, the amount of irrigation water was controlled by

the consumptive use of tomato plant which was calculated from the meteorological variables and crop coefficient (Kc) using the modified Blaney-Criddle formula as recommended by Dorenboss and Pruitt (1997).In case of SD irrigation, the main, submain lateral and emitters were placed at a depth of 20cm from the soil surface. Meanwhile, in SD irrigation the laterals and emitters are placed on soil surface. In both methods, the distances between laterals and drippers are 1 and 0.5 m, respectively. The drippers are of in-line internal type with a discharge of 2.5 L/S at 0.5 atm.The interval between two consecutive irrigations was three and six days in the drip and F systems, respectively. Need to mention that in F irrigation an additional 30% of the total amount of irrigation water was applied to satisfy irrigation efficiency and leaching requirements. Seedlings of tomato "Supper Marmande" cultivar were transplanted in March 2001. At the fruiting stage, the root system of three selected plants from each treatment was collected, following the wet excavation method described by Bohm (1979). Thereafter, length and size- distribution as well as number of tips were determined using Rizo instrument Inc (Delta T image Analysis system Type DIAS). During the growing season, soil salinity of active root zone layer (0 – 40 cm) and the layer underneath (40 – 60 cm) were determined at May, June and August according to Richard' s (1954).

RESULTS AND DISCUSSION

Soil Salinity

Data illustrated in figs (1 and 2) show that, irrespective of the applied treatments, salt accumulation, except few cases exhibit the two studied layers of the soil profile. On the contrary, it is clear that continuous application of irrigation water, even upon using relatively low salinity water has resulted in relatively high salt accumulation in soil profile as compared to the cyclic application strategy. These findings are in agreement with Rhoades (1990). As for the irrigation system, the data point out-except few cases-that normal drip irrigation (D) is generally superior than other irrigation systems in alleviating salinity build up in the two soil layers under study, most probably due to downward water and salt transport . Meanwhile, in case of SD irrigation system there are upward movements of water and salts which may contribute to the relative increase in salt accumulation in the soil. However, higher salinity build up under F irrigation compared to the other systems could be explained on the basis that the applied amount saline water using such method was higher than those applied by other systems.

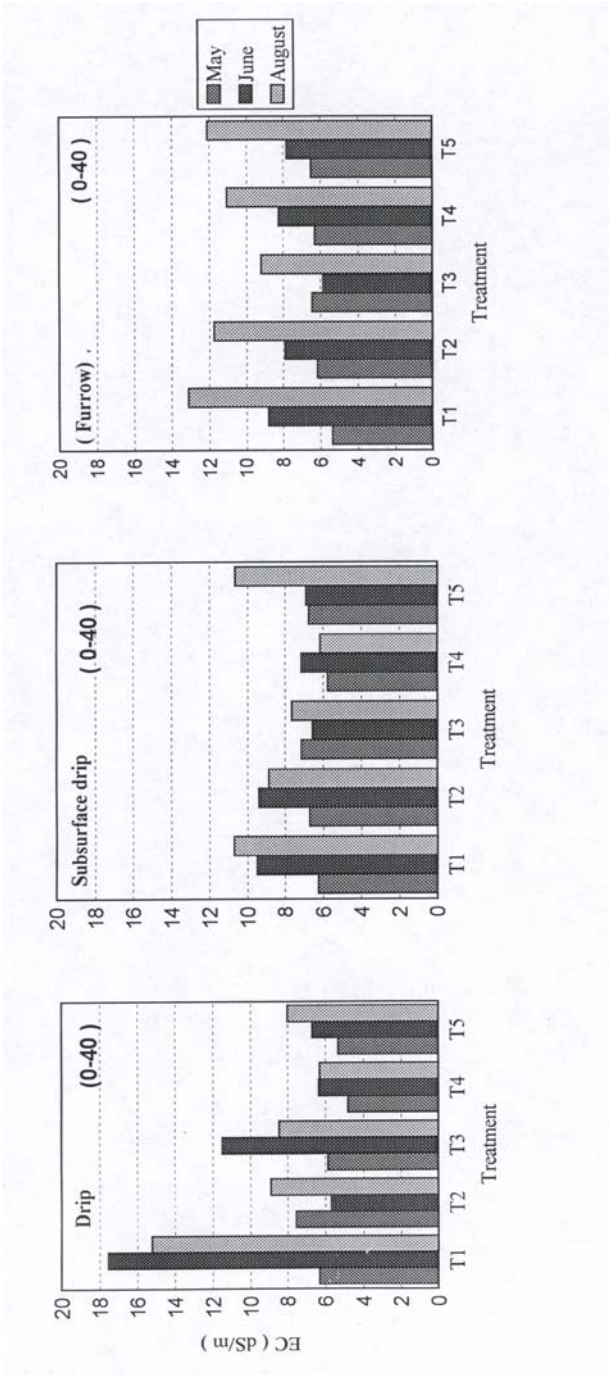

Fig. (1). Soil salinity of the surface soil layer (0-40 cm) at different periods during Tomato growth season under the applied treatment.

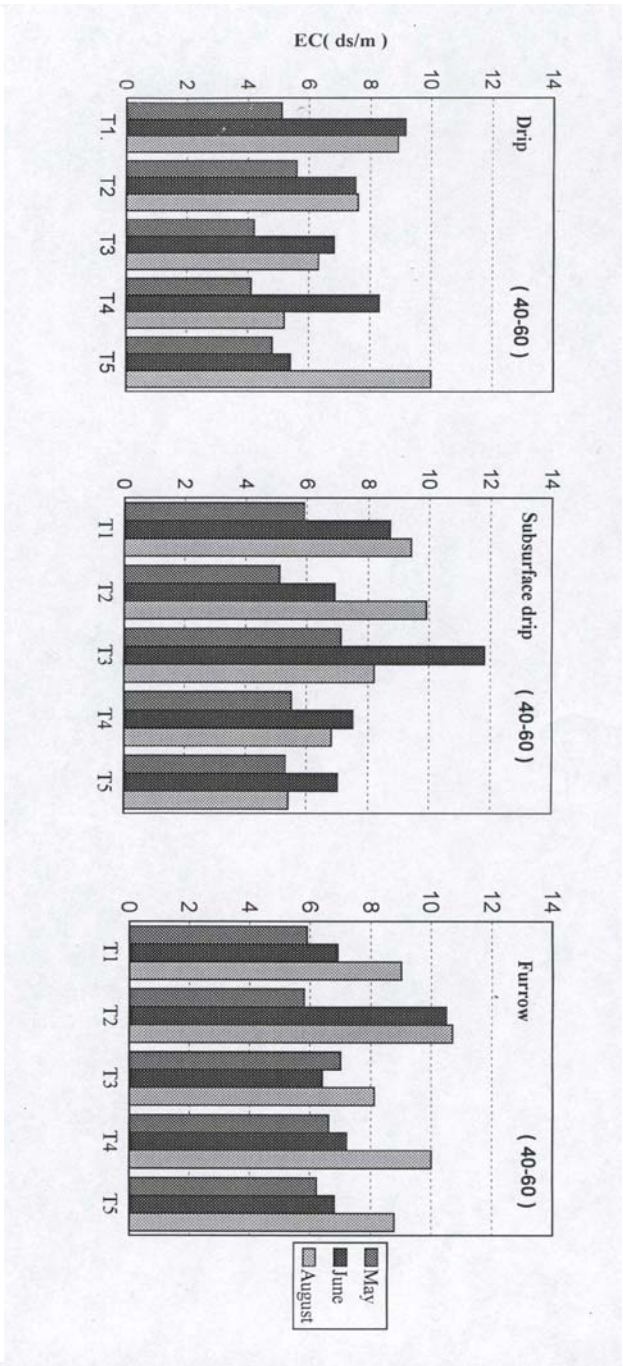

Fig. (2). Soil salinity of the subsurface soil layer (40-60 cm) at different periods during Tomato growth season under the applied treatment.

Root Growth

Table (1) plate (1) and figs. (3 and 4) display the influence of the applied treatments on the most important root growth parameters, i.e., length, size-distribution and proliferation. The data indicate that under any irrigation system the increase in salt concentration of irrigation water has resulted in pronounced decrease in the total root length, and the number of root- tips (branching). As for the management, it is evident that under any irrigation system alternating the use of high salinity water and low salinity water i.e., T_3 and T_4, the dilution occurring in the root has resulted in the best root length and branching. This behavior can be attributed to the fact that changing high salinity water to low salinity water causes significant salt leaching and attenuates salt build up in the root zone thereby increasing the root growth and branching. Such effect is less pronounced upon blending the two water sources in the water supply before application. For the irrigation system, it is evident that except very few cases subsurface drip caused greater root length and proliferation as compared to the other systems. In such case, the drippers were placed at a depth of 20 cm from the soil surface, i.e., within the root zone.

In conclusion the cycling application of different water qualities attenuates the build up of high soil salinity and thus enhances the root growth and proliferation. This encourages the use of saline water, particularly in those areas suffering from water shortage, such as Ras Sudr, South Sinai Governorate, Egypt.

TABLE (1). Length and number of tips of tomato cultivar and their several size distribution under the studied treatments of saline water.

Treatments	Studied Parameter	Drip				Subsurface Drip				Furrow			
		(0-2) mm	(2-3.5) mm	(3.5-5) mm	Total	(0-2) mm	(2-3.5) mm	(3.5-5) mm	Total	(0-2) mm	(2-3.5) mm	(3.5-5) mm	Total
T1	Length	402.09	58.13	66.38	526.6	137.11	00	00	137.11	267.25	28.24	30.08	334.57
	No.of Tips	3586	13	16	3616	3827	7	16	3850	1279	3	00	1282
T2	Length	365	34.6	23.32	422.91	481.14	90.08	75.57	646.79	185.56	29.52	41.51	256.58
	No. of Tips	2424	2	7	2433	3673	11	4	3688	1389	9	3	1401
T3	Length	703.51	86.61	73.66	863.78	494.1	28.5	48.33	570.93	311.88	35.63	49.58	397.09
	No.of Tips	4880	19	3	4902	5016	15	13	5044	2046	9	10	2065
T4	Length	705.94	97.56	100	903.5	6010.24	65.82	78.16	754.22	194.41	8.35	34.85	237.61
	No. of Tips	4023	26	10	4068	4478	4478	13	8	4499	1341	8	1362
T5	Length	360	30.89	22.44	426.61	470	66.42	70.21	606.63	179	14.11	34.72	250.46
	No. of Tips	1824	7	7	1838	3533	13	12	3568	1385	8	6	1399

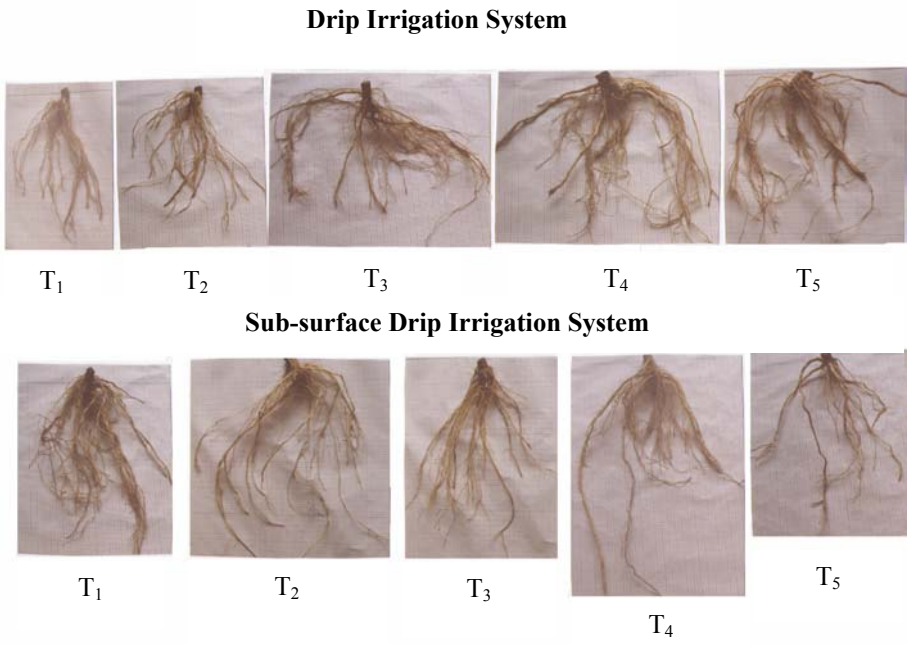

Plate (1). Influence of different irrigation systems on root growth.

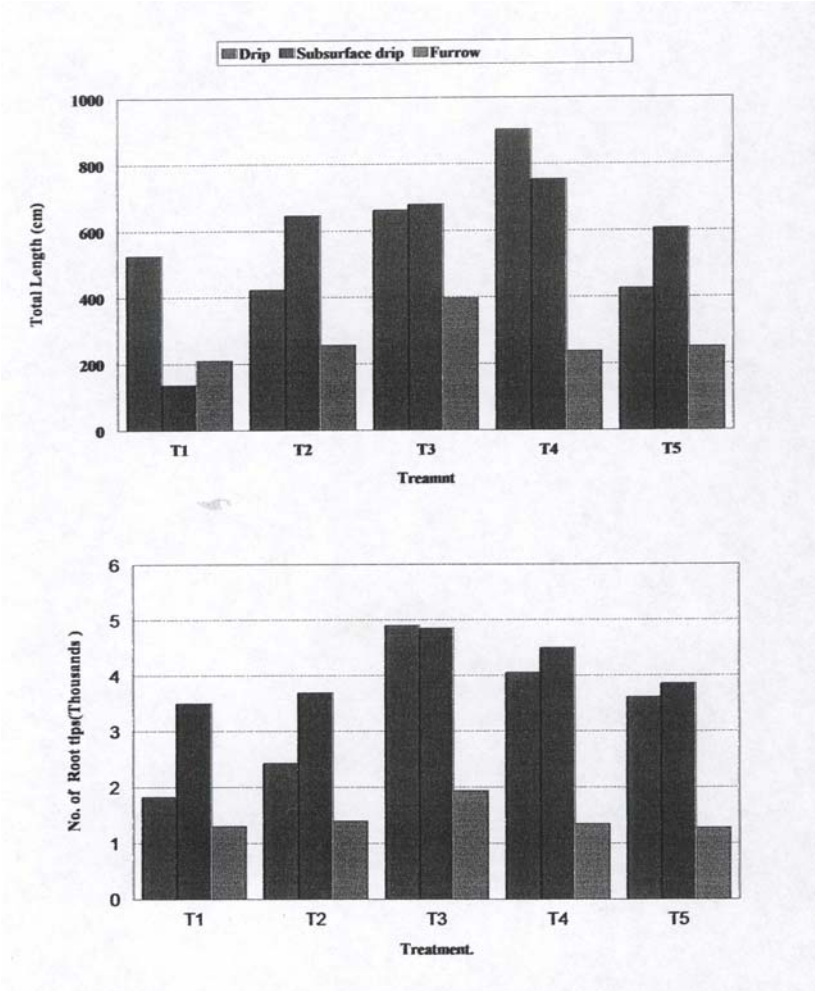

Fig. (3). Total Root Length (cm) and total No. of Root Tips (thousands) of Tomato plants under different irrigation systems.

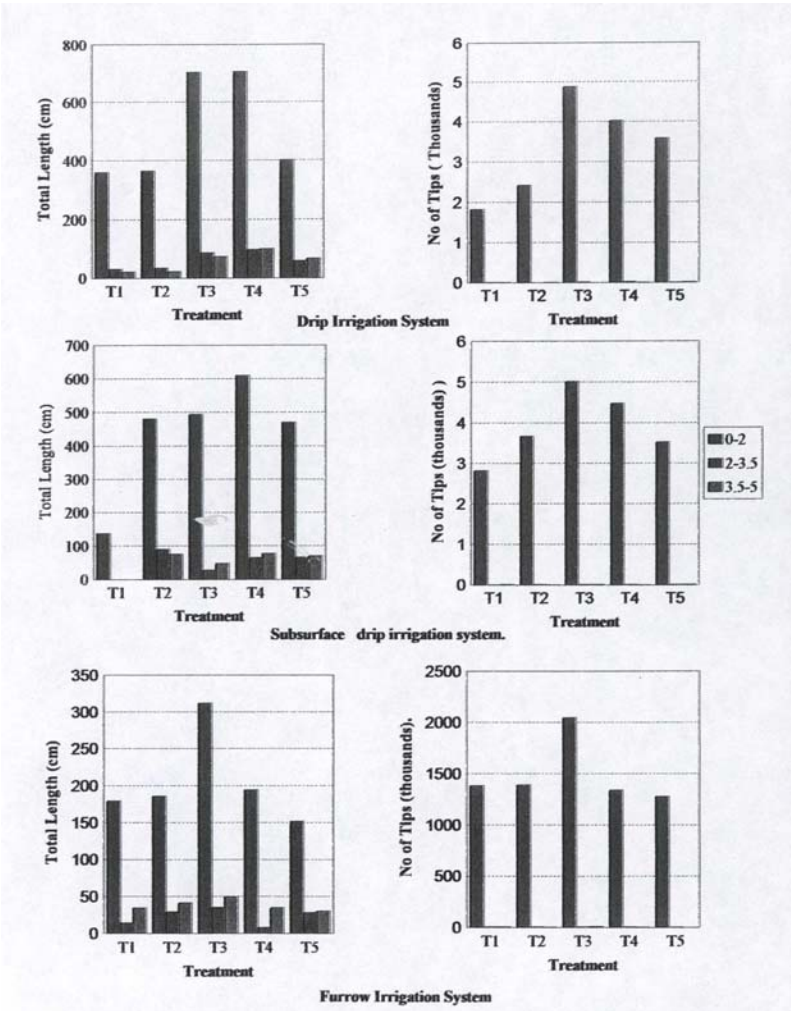

Fig. (4). Total Root Length (cm) and total No. of Root Tips (thousands) of Tomato plants under different irrigation systems.

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استجابة نمو وإنتاجية الطماطم لبعض تطبيقات نظم الري والمعاملات المختلفة بالماء المالح

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أستهدفت الدراسة التعرف على أثر تطبيق نظم مختلفة من الرى بالماء المالح على نمو جذور الطماطم صنف "سوبرمرماند" وأجريت التجربة بمحطة التجارب الزراعية التابعة لمركز بحوث الصحراء برأس سدر بجنوب سيناء .
دلت نتائج تحليل التربة التى أجريت بها التجربة على أنها تربة جيرية - ملحية غير قلوية - ذات قوام رملى طفلى .
أستخدمت ثلاثة نظم رى مختلفة وهى الرى بالتنقيط والرى تحت سطحى والرى بالغمر .
طبقت معاملات مختلفة من طرق الأضافة كما يلى:

a. الرى بمياة مرتفعة الملوحة ČĐ,ĒĐ ديسمز/م
b. الرى بمياة منخفضة الملوحة ē,čĒ ديسيمز/م
c. الرى التتابعى (الرى بمياة عالية الملوحة نصف الكمية ثم الرى بالمياة منخفضة الملوحة بنصف الكمية الباقية)
d. الرى التبادلى (وفيه يتم بالتبادل مرة بالرى عالى الملوحة والرية التالية بالرى منخفض الملوحة)
e. الرى المخلوط (حيث يتم خلط المياة عالية الملوحة مع المياة منخفضة الملوحة بنسبة Č:Ď

وقد أمكن التوصل الى النتائج التالية :-

- كان الرى بالتنقيط هو أفضل النظم المستخدمة بالمقارنة بالطرق الأخرى حيث أدى الى تقليل تأثير الملوحة المتكونة فى الطبقتين تحت الدراسة فى التربة.
- وجد أن أعلى نسبة ملوحة تكونت تحت نظام الرى بالغمر.
- دلت نتائج طرق الأضافة على أن معاملة الرى التتابعى أو التبادلى تؤدى الى أنخفاض كمية الملوحة المتكونة بقطاع التربة تحت الدراسة.
- أعطى نظام الرى التحت سطحى (المدفون) أعلى قيم لأطوال الجذوروذلك بالمقارنة بالطرق الأخرى.

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METHIONINE AND LYSINE SUPPLEMENTATIONS IN DIETS OR DRINKING WATER OF ONE-PHASE LOW DIETARY PROTEIN FEEDING SYSTEM

1- EFFECTS ON BODY WEIGHT, FEED UTILIZATION AND AGE AT SEXUAL MATURITY IN GROWING CHICKS

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This experiment was conducted to study the effect of methionine and lysine supplementation out to the level of 120% of requirements in feed or drinking water for one-phase low protein diet during growing period. A total number of 200 one-day old H and N brown nick female chicks were divided into three groups. Control group (C) fed according to the strain requirements on diets with 17, 15 and 14% CP during the periods of 0-5, 6-15 and 16-18 weeks of age. The other two groups were fed on one-phase low protein diet (14%CP) supplemented with methionine and lysine to the level of 120% of requirements either in feed (F) or drinking water (W).

Live weight has significantly ($P<0.05$) decreased at the first five weeks of age in groups F and W compared to group C. However, during the growing period (0-18 weeks), live body weight of group W (1522 gm) did not significantly differ than group C(1533 gm). Growth rate showed no significant differences in the experimental groups throughout the whole growing period.

Feed intake values (gm/bird/day) during 0-18 weeks of age were 55.05, 53.09 and 56.21 in C, F and W group, respectively. Through 0-18 weeks old, feed efficiency values were 0.213, 0.210 and 0.206 for the same groups, respectively. Birds in F and W groups consumed less protein than group C (9.38 gm/bird/day) during 0-18 weeks of age. Moreover, F and W groups recorded insignificantly better protein utilization value compared to C group. Age at sexual maturity was 130, 125 and 129 days for birds grown on C, F and W groups, respectively.

It could be recommended to use one-phase low protein diet (14% CP) supplemented with methionine and lysine to the level of 120% of requirements either in diet or drinking water for H and N female chicks during growing period.

Keywords: growing chicks, methionine, lysine, body weight, feed utilization, sexual maturity

The feeding costs of poultry production are generally the most expensive item, particularly the protein cost. Therefore, many workers tried to reduce feed costs by decreasing protein levels and supplementing diets with free amino acids especially methionine and lysine. For example, Chi (1985) and Keshavarz and Jackson (1992) reported no significant differences in body weight and feed intake of Leghorn chicks kept on 14.9% crude protein and supplemented by methionine and lysine when compared to those fed on 18.2% crude protein diet without supplementation. However, Douglas *et al*. (1985) found that birds receiving 14% crude protein plus supplemental methionine and lysine consumed less feed than birds fed 17% crude protein.

Sharma *et al*. (1990) and El-Khimsawy and El-Sharkawy (1991) reported that birds received low protein diet supplemented with methionine and lysine at 120% of suggested level of NRC gave better feed efficiency compared to the higher CP level.

Damron and Goodson-Williams (1987) and El-Khimsawy and El-Sharkawy (1991) found that the chicks received amino acids in drinking water gave slightly heavier live body weights than those received amino acids in the feed. In contrast, Boulos *et al*. (1987) and El-Khimsawy and El-Sharkawy (1991) found that amino acid supplementation in drinking water had no clear effect on feed consumption.

Chi (1984) and Mohamed (1994) reported that increasing protein level in the diet of growing chicks lead to an increase in the amount of protein intake and decrease the efficiency of protein utilization. However, Chi (1985) and El-Khimsawy (1992) reported that the lowest protein level gave the best efficiency of protein utilization. Proudfoot and Hulan (1986) reported that livability of growing birds was not influenced by dietary treatment.

Sexual maturity as judged by age at first egg was delayed for pullets fed on low protein diet supplemented with 2 gm DL- methionine/Kg (Chi, 1985). While, Maurice *et al*. (1982) and Okazaki *et al*. (1995) revealed that rearing regimens did not affect sexual maturity.

The aim of the present work is to study the effect of decreasing protein level and adding free amino acids either in diet or drinking water, on body weight, weight gain, feed utilization and age at sexual maturity in growing chicks.

MATERIALS AND METHODS

The present work was carried out at the Poultry Experimental Station, Faculty of Agriculture, AL-Azhar University to study the effect of methionine and lysine supplementation either in diet or in drinking water for one-phase low protein diet on performance of growing chicks. Pure crystalline powder of DL-methionine and L-lysine were used in this experiment as they have a good solubility in water and easy to mix with diet.

A total number of 200 one-day old females H&N "Brown Neck" chicks hatched on October, 1997 were randomly distributed into three experimental groups; Control (C), Feed (F) and Water (W) treatments. 70 birds in control treatment (C), were divided into 3 replicates (23, 23 and 24 birds) and fed on 17% CP diet from first day to 5th weeks of age (stage I), 15% CP diet from 6-15 weeks of age (stage II) and 14% CP diet from 16-18 weeks of age (stage III), 65 birds in treatments (F) and also the same number in treatment (W), each divided into 3 replicates (22, 22 and 21 birds) and fed on one phase low protein diet (14% CP) supplemented by methionine and lysine either in feed or drinking water to the level of 120% of requirements, respectively. Formulation and chemical composition of the experimental growing diets are shown in table (1).

During rearing period, chicks were weighed weekly. Feed consumption, live body gain and mortality rate were recorded. Rate of growth was calculated as Rate of growth = 200 [We - Wo / d (We + Wo)] where: We = weight at any time, Wo = initial weight and d = days of period (El-khimsawy, 1983).

Feed efficiency was calculated as live body weight gain divided by feed consumed. Protein utilization was calculated as live body weight gain on protein consumed. Sexual maturity as judged by age at first age was also recorded.

Statistical Analysis

Analysis of variance was carried out according to Snedecor and Cochran (1967). Significant differences between means were made by Duncans multiple range test (SAS, 1988). The linear model for the experiment was as follows:

$Y_{ij} = \mu + T_i + e_{ij}$

where: Y_{ij} = the j observation on the i th treatment

μ = Over all mean

T_i = Effect of the i^{th} treatment. (i = 1, 2 and 3)

e_{ij} = Random error treatment.

TABLE (1). Composition and analysis of growing diets during 0-18 weeks.

Ingredients	Control diets			Experimental diets		
	week 0-5	week 6-15	week 16-18	week 0-5	week 6-15	week 16-18
Yellow corn	67.5	70.5	71.0	71.0	71.0	71.0
Soybean meal (44% CP)	17.0	13.5	13.7	13.14	13.21	13.7
Concentrate [(a)]	4.5	2.5	1	1	1	1
Wheat bran	8.5	10.3	10.5	10.5	10.5	10.5
Calcium carbonate	0.9	1.25	1.43	1.43	1.43	1.43
Di calcium phosphate	0.6	0.95	1.37	1.37	1.37	1.37
DL-methionine	-	-	-	0.23	0.22	-
L-lysine	-	-	-	0.33	0.27	-
Vit. B complex [(b)]	0.25	0.25	0.25	0.25	0.25	0.25
Vit. AD3E [(c)]	0.25	0.25	0.25	0.25	0.25	0.25
Mineral mix. [(d)]	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**	**100**
Calculated values						
Crude protein %	17.04	15.03	14.01	14.01	14.01	14.01
ME (Kcal /kg)	2858	2856	2854	2854	2854	2854
Calcium %	0.9	0.9	0.9	0.9	0.9	0.9
Av. phosphorous %	0.41	0.41	0.4	0.4	0.4	0.4
Methionine + Cys. %	0.6	0.59	0.5	0.72	0.69	0.5
Lysine %	0.8	0.75	0.6	0.96	0.9	0.6
Analyzed values						
CP %	17.19	15.18	14.20	14.04	14.02	14.20
EE %	2.50	1.71	2.35	2.11	1.82	2.35
CF %	2.83	3.45	2.83	2.75	2.77	2.83
NFE %	62.28	66.34	67.42	66.33	66.74	67.42
OM %	84.80	86.68	86.80	85.23	85.35	86.80
Ash %	6.12	5.34	5.38	5.41	6.92	5.38
DM %	90.92	92.02	92.18	90.64	92.27	92.18
Moisture %	9.08	7.98	7.82	9.36	7.73	7.82
Total	**100**	**100**	**100**	**100**	**100**	**100**

[(a)] Contains CP 51%; ME 2400 Kcal /kg; Ca 8%; Av. p. 3.51%; Met. 1.69%; Lys 3.19%.
[(b)] Each kg contains: vit. B1 20 gm; vit. B2 4.5 gm; vit. B6 3 gm ; vit. B12 13 gm; choline chlorid 100 gm.
[(c)] Each kg contains: vit. A 20,000 IU; vit. D3 2000 IU; vit. E 400 IU.; K2 1 gm
[(d)] Each kg contains: Mn 40 gm ; Zn 45 gm ; Cu 3 gm ; Fe 30 gm ; I 0.3 gm ; Se o.1 gm.

RESULTS AND DISCUSSION

Effect of Dietary Methionine and Lysine Supplementation to Low Protein Diet on:

Body weight and rate of growth

Using one phase low protein diet supplemented with methionine and lysine either in feed or in drinking water (Table 2) significantly ($P<0.05$)

decreased live body weight at the first five weeks of age. This result agreed with Boulos *et al*. (1987) who reported that most of the differences between the live body weight of the chicks received amino acids either in feed or drinking water had occured in the second and third weeks of age. In the same way, Abdel-Hakim *et al*. (1992) added that live body weights of L.S.L chicks received 15% crude protein in the diet was 327 gm at the 6th week of age compared to 375 gm for that received 17% crude protein level in the diet.

Live body weight of H and N chicks at the 15-weeks old was not affected by the crude protein level in the diet as long as methionine and lysine requirements was added (Table 2). This result had been confirmed previously by Chi (1985), Abdel-Hakim *et al*. (1992) and El-Khimsawy (1992). At 18-weeks, averages of live body weight were 1533, 1565 and 1522 gm for C, F and W groups, respectively. Analysis of variance indicated that differences between C and F groups were significant ($p<0.05$), while the differences among W group and other groups were insignificant. These results illustrated that one-phase low protein diet supplemented with methionine and lysine at 120% of suggested level by NRC (1994) in drinking water for H and N layer strain chicks attained live body weight nearly equal to control regimen (step-down dietary protein regimen).

In the present study, average live body weights of H and N chicks throughout the experimental period (0-18 weeks) showed no significant differences among the different treatments. Similarly, Chi (1985) and Keshavarz and Jackson (1992) cleared that White Leghorn chicks kept on lower crude protein supplemented by methionine and lysine were similar in weight to pullets fed on high crude protein diet without supplementation.

It is worth to note that live body weights of chicks received the diet supplied with amino acids in drinking water were heavier particularly at the first five weeks ($P<0.05$) than that received the amino acids in feed. Similar findings were obtained by Damron and Goodson-Williams (1987), El-Kimsawy and El-Sharkawy (1991) and El-Khimsawy (1992). This might be due to that methionine and lysine providing in the drinking water are effectively assimilated by chicks and increased total amino acids intake and hence, improved live body weight feed was higher in W treatment.

The present study showed that the influence of the starter diets (0-5 weeks) on body weight disappeared with the increasing of age up to 18 weeks. This result indicates that the protein requirements of H and N layer-type chickens during growing period are less than 17% and gradually decreasing with advanced age up to 18 weeks. This mean that satisfactory growth with considerable savings of protein and adding lysine and methionine could be achieved during the growing period.

Observation of growth rate (Table 2) indicated that control group was significantly ($P<0.05$) better than other groups during 0-5 weeks old. While

during 6-15 weeks old, control group was lower than groups F and W. However, during 16-18 and 0-18 weeks old, there were no significant differences among treatment groups. This explained that birds of F and W groups became more adapted to the experimental diets after 5 weeks of age and showed sometimes higher significant values in growth rate compared to C group.

TABLE (2). Body weight and rate of growth of H and N chicks from 0-18 weeks of age as affected by dietary protein and amino acids programs.

Treatment-	initial weight (gm.)	Age (weeks)							
		0 – 5		6 - 15		16 – 18		0 – 18	
		Body weight (gm.)	Rate of Growth (%)	Body weight (gm.)	Rate of growth (%)	Body Weight (gm.)	Rate of Growth (%)	Body weight (gm.)	Rate of growth (%)
C	40	275A	4.262A	1242A	1.821B	1533A	1.001A	1533	1.507
F	39	237C	4.096B	1211A	1.923A	1465B	0.905A	1465	1.505
W	38	250B	4.209A	1251A	1.903A	1522AB	0.935A	1522	1.510

Means in same column with the same letter **A,B**,..are not significantly different ($p<0.05$).

Body weight gain, feed intake and feed efficiency

Body weight gain (gm/bird/day) did not significantly influenced by different treatments throughout the whole experiment (Table 3). Birds in group F showed insignificant decrease in feed intake compared to C or W groups during 0-5 weeks. This result support findings by Douglas *et al.* (1985), as birds receiving 14% CP plus added methionine and lysine consumed less feed than birds fed 17% CP. However, the present study revealed no difference between feed intake of C and W groups at 5 weeks of age. During 6-15 weeks old, analysis of variance showed that birds in group W consumed more feed ($P< 0.05$) compared to birds in group F, while differences among C and other groups were insignificant. These results indicate that supplementation of methionine and lysine in one-phase low protein diet decreased feed intake, while addition of the same amino acids in drinking water resulted in increasing feed intake. However, Chi (1985) and Douglas *et al*. (1985) reported that feed consumption of birds fed low protein diet supplemented with methionine and lysine was insignificantly less than that fed high protein diet without supplementation. In contrast, Damron and Goodson-Williams (1987) found that control chicks ate significantly less feed than chicks received liquid methionine in the drinking water. Generally, El-Khimsawy and El-Sharkawy (1991) cleared that amino acid supplementation in drinking water had no clear effect on feed consumption. Similar results were obtained by Boulos *et al*. (1987) and El-Khimsawy (1992).

During 0-5 weeks, control group attained feed efficiency better than that of groups F and W which nearly attained the same number of feed efficiency.

During 6-15 weeks, C group attained feed efficiency significantly (P<0.05) worse than that of F and W groups, also F group attained better feed efficiency than that of W group. During 16-18 weeks and during whole growing period, all differences among feed efficiency were insignificant. These results are in agreement with those reported by Chi (1984). Also, Sharma *et al*. (1990) and EL-Khimsawy and EL-Sharkawy (1991) reported that groups received low protein diet supplemented with methionine and lysine at 120% of suggested level of NRC gave better feed efficiency.

TABLE (3). Effect of dietary protein and amino acid programs on average body weight gain, feed intake and feed efficiency of H and N chicks during growing period.

Treatment	Measurements	Age (weeks)							
		0-5		6-15		16 - 18		0 - 18	
		(gm)	(%)	(gm)	(%)	(gm)	(%)	(gm)	(%)
C. group	Gain gm / bird / day	6.17	100	a 13.82	100	a 13.90	100	11.7	100
	Feed intake gm / bird /day	18.25	100	AB 59.27	100	A 87.62	100	55.05	100
	Feed efficiency	0.338	100	***C*** 0.233	100	***A*** 0.159	100	0.213	100
F. group	Gain gm / bird / day	4.99	80.9	a 13.92	100.7	a 12.13	87.3	11.13	95.1
	Feed intake gm / bird / day	16.67	91.3	B 56.03	94.5	A 86.58	98.8	53.09	96.4
	Feed efficiency	0.299	88.5	***A*** 0.248	106.4	***A*** 0.140	88.1	0.210	98.6
W. group	Gain gm / bird / day	5.42	87.8	a 14.29	103.4	a 12.98	93.4	11.60	99.2
	Feed intake gm / bird / day	18.20	99.7	A 59.59	100.5	A 90.85	103.7	56.21	102.1
	Feed efficiency	0.298	88.2	***B*** 0.240	103	***A*** 0.143	89.9	0.206	96.7

Means in column with the same letter (a,b,..), (A,B,..) or (***A,B***,..) are not significantly different (p<0.05)

Protein utilization

Birds in F and W groups ate less protein than control group at all experimental growing periods with slightly difference between them (Table 4). This is a logical result, as birds kept on low protein level consumed less feed than that kept on high protein level. In other words, birds received low protein level consumed equal or less feed compared to that received high protein level. This, however, confirmed by Proudfoot and Hulan (1986) who found that the amount of protein consumed during rearing period

differed significantly between low and high protein diet. Similar results also, obtained by Cheng *et al*. (1991).

During 0-5 weeks, protein utilization of group C was worse than that of group F or W, while groups F and W recorded equal protein values. These results were in agreement with those showed by Chi (1984) and Mohamed (1994) who reported that increasing protein level in the diet of growing chicks lead to an increase in amount of protein intake and decrease the efficiency of protein utilization.

During 6-15 weeks, protein utilization recorded by F group was significantly ($P < 0.05$) better than those of C or W group. Chicks of group W attained significantly ($P<0.05$) better protein utilization than the corresponding value of group C. These results were in agreement with finding obtained by Chi (1985) and EL-Khimsawy (1992) who reported that the lowest protein level gave the best efficiency of protein utilization.

During 16-18 weeks of age, protein utilization of control group was slightly worse than those of F and W group, which showed a close difference of protein. These results may be because the protein level in the diet during this period was similar in all experimental groups (14% CP), while the slight difference may be because diets received by F and W group were supplemented by methionine and lysine. However, Sharma *et al.* (1990) and EL-Khimsawy and EL-Sharkawy (1991) reported that groups received diet supplemented with methionine and lysine at 120% of suggested level of NRC (1994) gave better protein efficiency.

Generally, during the whole period of growing (0-18 weeks) it could be noticed that birds of group F and W recorded better protein efficiency than group C (about 120 and 117.6%, respectively). These results might be due to the fact that groups of F and W fed a diet which had two improving factors for protein utilization namely low protein level and supplementation with crystalline amino acids (El-Khimsawy 1992 and Mohamed, 1994) and (Sharma *et al*., 1990 and El-Khimsawy and El-Sharkawy, 1991).

The beneficial effect of amino acid supplementation may be due to the direction of the greatest part of the available protein to the production of meat. This is accompanied by the decrease of waste because none of amino acids can be limiting to the use of the other as all of them are available almost in the ratio needed to compose the protein produced (El-Khimsawy and El-Sharkawy, 1991).

Age at sexual maturity

Sexual maturity of H and N pullets as affected by feed treatment either fed on step-down dietary protein of 17, 15 and 14% CP as control (C) or one-phase low protein diet supplemented with methionine and lysine either in feed (F) or in drinking water (W) is shown in table (5).

Age at first egg was found to be 130, 125, and 129 days for chicks grown on C, F and W treatments, respectively. It could be clearly noticed

that birds grown on F treatment matured sexually early than birds in C and W groups. However, differences among the experimental groups were not significant.

TABLE (4). Effect of dietary protein and amino acids programs on protein utilization of H and N chicks during growing period.

Treatments	Measurements	Age (weeks)				
		0 - 5	6 - 15	16 – 18	0 - 18	%
C. group	Protein intake gm / bird / day	3.11	a 10.10	a 14.93	9.38	100
	Protein efficiency	1.98	C 1.37	A 0.93	1.25	100
F. group	Protein intake gm / bird / day	2.34	b 7.84	b 12.13	7.44	79.3
	Protein efficiency	2.13	A 1.78	A 1.00	1.50	120
W. group	Protein intake gm / bird / day	2.55	b 8.34	b 12.72	7.88	84.0
	Protein efficiency	2.13	B 1.71	A 1.03	1.47	117.6

Means in same column with the same letter (a,b,..) or (A,B,..) are not significantly different ($p<0.05$).

The previous results were in the contrary of those found by Chi (1985) who reported that sexual maturity as judged by age at first egg was delayed for pullets fed on low protein diet supplemented with 2 gm DL-methionine /Kg. On the other hand, Maurice *et al*. (1982) concluded that rearing regimens did not affect sexual maturity. Also, Okazaki *et al*. (1995) found that age at first egg was not affected by different treatment diets contained 100, 115 and 130% of NRC requirements of nutrients.

These results gave a proof that age at first egg was insufficient parameter for judgment the sexual maturity compared to age at 10% egg production because the first parameter was very changeable by the individual variation of chicks.

TABLE (5). Effect of dietary protein and amino acid programs during growing period on age at sexual maturity.

Measurements	**Treatments**		
	C	**F**	**W**
Number of birds	66	67	67
Body weight at 18 weeks kg	1.533a	1.465b	1.522ab
Age at first egg production day	130	125	129

Means in same column with the same letter are not significantly different

Mortality rate

Mortality rate of H and N laying-type grower chicks fed on step-down dietary protein regimen (C) or one phase low protein diet supplemented by methionine and lysine either in feed (F) or in drinking water (W) were found to be 3, 1 and 2 birds for groups C, F and W, respectively, during 0-2 weeks, after that no mortality were recorded (Table 6).

These results were in the contrary of findings by Carlson and Nelson (1981) who found that the livability was slightly higher for birds grown on the low protein diet. On the other hand, Proudfoot and Hulan (1986) and Keshavarz and Jackson (1992) reported that livability was not influenced by dietary treatments.

TABLE (6). Mortality rate of chicks in the different experimental groups

Measurements	C	F	W
No. of birds	66	67	67
Mortality number	3	1	2
Mortality rate%	4.55	1.49	2.99

Economical evaluation

Table (7) showed that birds grown on F treatment attained the lowest feed cost and also the lowest cost per Kg live body weight chicks followed by those grown on W treatment, while chicks grown on C diet recorded the highest value in this respect. However, this result agreed with those reported by Proudfoot and Hulan (1986).

TABLE (7). Economical evaluation as affected by dietary protein and amino acid supplementation during growing period.

Measurements	C	F	W
Total feed cost (L.E. /bird)	6.627	5.987	6.530
Relative feed cost/bird	100	90.30	98.5
Average body weight gain, Kg (0-18 wks)	1.467	1.466	1.472
Total cost (L.E./ Kg live body weight)	4.517	4.084	4.436
Relative cost	100	90.4	98.2

It could be recommended to use one-phase low protein diet (14% CP) supplemented with methionine and lysine to the level of 120% of requirements either in diet or drinking water for H&N female chicks during 0-18 weeks of growing period.

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التدعيم بالميثيونين والليسين فى العليقة أو ماء الشرب لتعويض التقييد على الحد من البروتين المتاح .

التغير فى الجموع الأنتفادى من الإمراء التقييد عند النمو الجنسى و الدجاج النامى .

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أجريت هذه التجربة لدراسة تأثير الدعم بالميثيونين والليسين إلى مستوى ١٠٠% من الاحتياجات فى العليقة أو ماء الشرب لنظام التغذية على مستوى واحد منخفض من البروتين وذلك فى مرحلة النمو. تم تقسيم عدد ٤٨٠ كتكوت H and N إناث عمر يوم إلى ثلاث مجموعات. غذيت مجموعة المقارنة (C) على مستويات بروتين ١٨، ١٦، ١٤% فى المراحل من ١-٦، ٧-١٤، ١٥-٢١ أسبوع على الترتيب حسب احتياجات السلالة. حصلت مجموعة (F) على مستوى واحد من البروتين هو ١٤% مع الدعم بالميثيونين والليسين إلى مستوى ١٠٠% من الاحتياجات فى العليقة، بينما حصلت مجموعة (W) على نفس العليقة السابقة ولكن كان الدعم فى ماء الشرب.

لوحظ إنخفاضا معنويا فى متوسط وزن الجسم فى طيور المجاميع F ، W عند عمر ٦ أسابيع بالمقارنة بمجموعة المقارنة C وبوجه عام لم يكن هناك اختلاف حقيقى بين المجموعة W (١٤٦٠جم) ومجموعة المقارنة (١٤٧٠جم) أو بين المجموعة W والمجموعة F (١٤٩٤ جم). لم يكن هناك فارق معنوى فى معدل النمو بين المجموعات خلال فترة النمو الكلية. إستهلكت طيور مجموعة F كمية غذاء أقل من باقى المجموعات (٦٠,١٤ جم/طائر/يوم) بينما إستهلكت طيور المجموعة W أكبر كمية غذاء (٦٤,٥١ جم/طائر/يوم) وإستهلكت مجموعة المقارنة ٦٠,١٤ جم/طائر/يوم.

حققت مجموعة المقارنة خلال فترة النمو الكلية (١-٧ أسبوع) كفاءة تحويل (١,٥٧) أفضل من مجموعتى F (١,٥٨) ، W (١,٥٨٤) إلا أن الفروق لم تكن معنوية فى هذا الصدد. إستهلكت طيور مجموعتى W، F كمية بروتين أقل من مجموعة المقارنة وذلك خلال فترة النمو. فى الفترة من ١-٧ أسبوع كانت كفاءة البروتين لطيور مجموعتى W، F أفضل من مجموعة المقارنة. كان الفارق معنويا خلال الفترة من ٤-٦ أسبوع بينما لم يكن هناك فارق معنوى خلال الفترة من ٧-١٤ أسبوع. كان العمر عند النضج الجنسى هو ١٥٠، ١٥٦ يوم فى كل من C ، F، W أسرع على التوالى.

خلصت هذه الدراسة إلى أنه يمكن التوصية بعمل عليقة منخفضة فى نسبة البروتين (١٤%) للكتاكيت النامية من سلالة H and N Brown Neck مع إضافة الليسين والميثيونين حتى مستوى ١٠٠% من الاحتياجات الفعلية فى العليقة أو مياه الشرب للحصول على أداء إنتاجى جيد لهذه الطيور.

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RICE STRAW FOR HEAVY METALS REMOVAL FROM EFFLUENTS

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Rice plant produces large quantities of rice straw which has been used in agriculture, construction, metal recovery and water pollution control. The removal of cadmium and copper by rice straw was investigated. Data obtained reveal that rice straw is an effective metal absorbent for these two metals. The adsorption capacity of this material increases as the initial metal concentration decreases. Adsorption equilibria were established rapidly at the early stage of reaction and decreased markedly after 1 hr.

The removal phenomenon appears to be that the rice straw neutralizes the metal solution due to its alkaline nature. The presence of high ionic strength does not have any significant effect on the adsorption of these metals by rice straw. The effect of solution pH on adsorption was also studied.

Keywords: rice straw, cadmium, copper, adsorption.

Effluents from metal industries increase the levels of toxic heavy metals in water and soil. Awareness of the hazards of heavy metals covers a wide spectrum of metals as Pb, Cd, Cr, Cu and Zn (Dean *et al*., 1972). Among these, Cd poisoning in humans is the most serious as it causes severe dysfunction of the kidneys, reproductive system, liver, brain and central nervous system (Manahan, 1994).

Methods used to remove heavy metals from wastewater include ultra filtration, precipitation, electrolytic processes, reverse osmosis, ion exchange, activated carbon, solvent extraction and biological systems (Narayan and Bandyripadhyay, 1992; Panday *et al*., 1984; Evan, 1985; Elliot *et al*.,1986 and Vega Farfan *et al*.,1996). Most of these methods are expensive, involving both elaborate and costly equipment or high operation costs and energy requirements. The ultimate disposal of the contaminants may also be a problem in these techniques (Lin and Huang, 1994). Recently, the recovery and recycling of organic residues (agricultural, urban industry, etc.) became a major area of investigation in developed countries. Agricultural wastes such as tree bark, peanut skin and hull and growing

plants (tobacco and tomato root tissue) have been used to remove heavy metals from water (Randall and Hantala, 1975; Scott, 1992 and Lujan *et al.,* 1994).

Rice straw, for many years, has been considered a waste material, the quantities of which continued to increase (2.5 million ton/year), hence the motivation to look for possible industrial and environmental application is of interest. One of these is the potential use in soil pollution control.

In this study, an investigation of the treatment of metal effluents (Cd and Cu) using rice straw is conducted.

MATERIALS AND METHODS

Rice straw used in this study was obtained from mature rice plants in two fractions (0.5-1.0 mm and < 0.5 mm). Both fractions were analyzed for their chemical composition (Table1) where the rice straw fractions were melted with a mixture of 1:1 w/w boric acid and lithium carbonate at 950^{o}C. Then, the fused mixture was treated with deionized water and concentrated nitric acid to obtain the sample solution (Julia *et al*., 1998). The surface area was measured by the BET nitrogen desorption method.

X-ray diffractogram for the fine fraction (<0.5 mm) showed that the major components of rice straw are aluminum silicates, iron oxychloride and silicon phosphide (Fig.1). Cadmium and Cu solutions were prepared from analytical reagent grade $CdSO_4$ and $CuSO_4$, respectively. Sulfuric acid and NaOH were used to prepare the different metal solutions.

TABLE (1). Chemical composition of rice straw.

Component	<0.5 mm	1.0-0.5 mm
Al_2O_3	32.40	33.1
SiO_2	49.00	48.7
Fe_2O_3	6.90	6.60
CaO	4.81	5.10
MgO	1.70	1.20
Na_2O	0.64	0.61
K_2O	4.00	3.70
Cd	0.014	0.020
Cu	0.267	0.357
S.A.cm^2/g^*	12200	9830

* = Surface area

The adsorption experiments were carried out in polyethylene bottles by mixing fly ash with Cd and Cu metallic solutions, shaken at room temperature and then allowed to separate by gravity. The supernatant liquid was analyzed for pH, cadmium and copper.

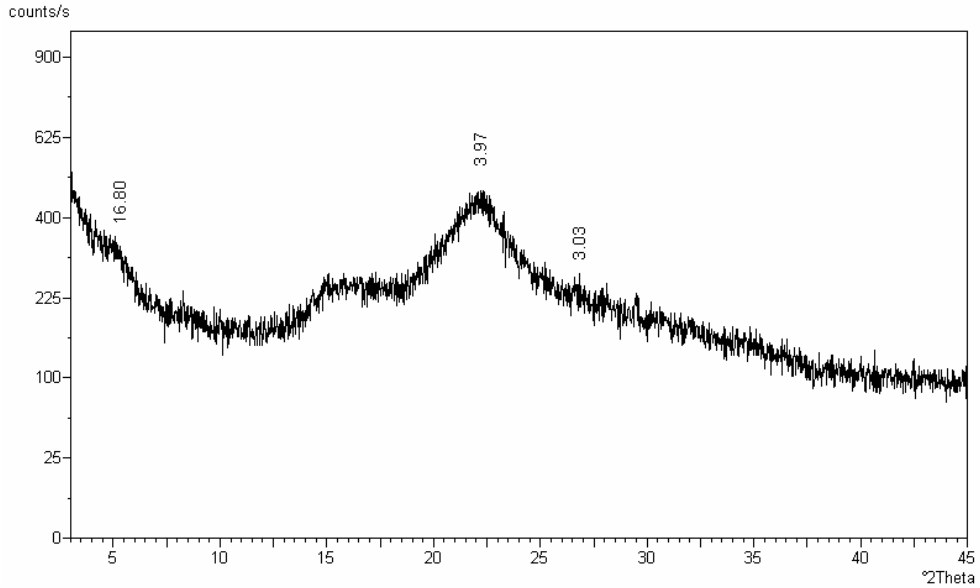

Fig. (1). X- ray diffractogram of rice straw (fine fraction).

Different parameters were then studied: initial metallic concentration, pH, contact time, adsorbent concentration, grain size and ionic strength.

The adsorption was studied with different initial metallic concentrations: 0.25, 0.50, 1.00, 1.50 and 2.00 mg/l Cd and 2.00, 3.00, 5.00, 10.00 and 20.00 mg/l Cu, all of them adjusted at pH 5.0. The adsorption kinetics were studied at pH 5.0 using 2.00 mg/l Cd and 20.00 mg/l Cu, the samples were shaken for 5, 15, 30 and 60 minutes.

The effect of pH of the initial solutions on the adsorption process was studied using solutions having pH range between 1 and 5 adjusted with H_2SO_4 acid and NaOH.

The effect of ionic strength was studied using Na_2SO_4 and potassium sulphate in the range of 10^{-1} to 10^{-4} M.

RESULTS AND DISCUSSION

Effect of Initial Concentration

For the different initial Cd concentrations, adsorption equilibrium was rapidly achieved. The results indicate that the adsorption capacity increases

as the initial Cd concentration decreases for both fractions of rice straw, but the adsorption capacity of the finest fraction is distinctly better than that of the coarser one. It is also found (Fig. 2) that the lower initial concentration of the metal (0.25 and 0.50 mg/l), the greater percent of the metal removal when compared to the higher initial metal concentrations (1.5 and 2.0 mg/l).

Additionally, the results further show that the ultimate removal of Cd with the initial Cd concentration of 0.25 – 0.50 mg/l ranged from 60 to 88 % and from 40 to 67 % for both straw fractions (<0.5 mm and 0.5- 1.0 mm, respectively), while that of Cu seems to be in a little bit lower range (32 – 66 % and 33 – 50 %) with the initial concentration of 2.0 – 3.0 mg/l for the same fractions (Table 2). Figure (3) shows an example of this comparison, indicating that Cd has more affinity for adsorption on rice straw than Cu.

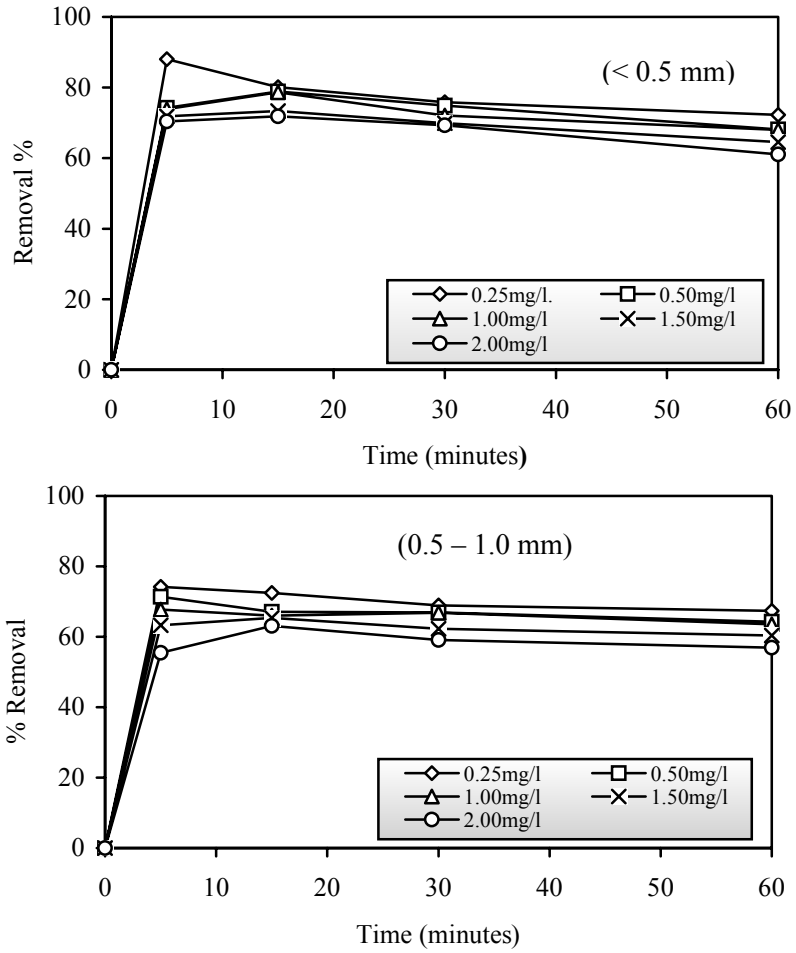

Fig.(2). Effect of initial concentration on Cd removal (Rice straw: 40g/l).

Values of metal uptake can be reported in metal sorbed/g. Data in table (3) show that the higher values (0.123 and 1.313 mg/g) for Cd and Cu, respectively were observed with the adsorbent amount of 10 g/l only. The maximum Cd and Cu adsorption capacity of rice straw can be attributed to the interaction of metal with surface silica sites as well as only a small contribution from alumina sites.

TABLE (2). Changes in suspension pH values and percent removal of Cu by rice straw as affected by adsorbent amount.

Adsorbent amount g/l		initial Cu concentration, mg/l									
fine fraction	coarse fraction	2.0		3.0		5.0		10.0		20.0	
		pH	% removal	pH	% removal	pH	% removal	pH	% removal	pH	% removal
10		8.05	32.79	8.07	37.01	7.98	52.69	7.80	52.18	7.48	50.95
20		8.12	40.37	8.10	48.36	8.11	53.03	8.09	56.47	7.81	54.95
40		8.31	66.20	8.27	55.17	8.13	55.41	8.11	57.01	7.89	58.85
	10	7.72	33.90	7.75	34.70	7.55	30.95	7.43	29.13	7.15	21.83
	20	7.75	36.65	7.75	37.19	7.64	35.52	7.48	35.69	7.29	26.25
	40	7.82	50.42	7.61	42.59	7.64	45.99	7.56	41.21	7.42	32.24

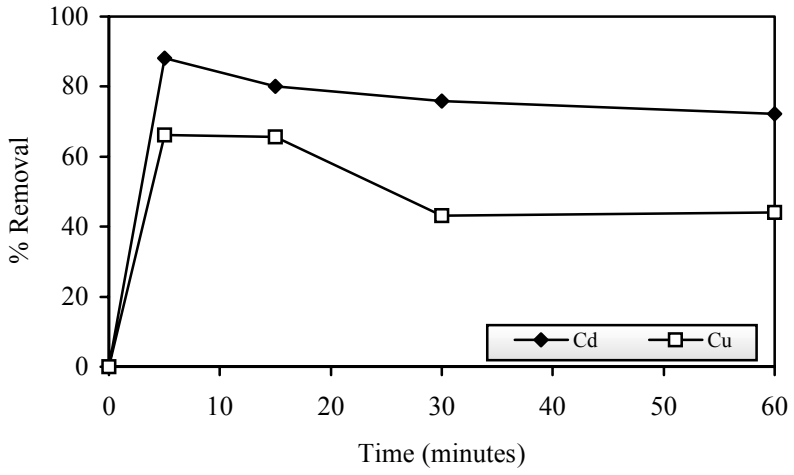

Fig. (3). Adsorption of Cd and Cu on rice straw. Adsorbent concentration: 40 g/l; fraction (<0.5 mm); Cd, initial concentration: 0.25 mg/l; Cu, initial concentration: 2.0 mg/l.

Effect of pH

The pH in solution has been identified as the most important variable governing metal adsorption on biosorbents. As the pH increase, aqueous cations hydrolyse according to the generalized expression for divalent metals.

$$M^{+} (aq.) + n\ H_2O = M\ (OH)_n^{2-n} = n\ H^{+}$$

This hydrolysis may be accompanied by precipitation of metal hydroxide (Panday *et al.,* 1984 and Elliot *et al.,* 1986). The effect of pH on sorption of cadmium and copper on rice straw was studied at room temperature by varying the pH of metal – rice straw suspension from 1 to 5.

Figure (4) shows that Cd retention capacity by rice straw depends on the pH of the initial metal solution, where retention decreases with decreasing pH. The same behaviour was observed with Cu solutions (Table 4). Rice straw can neutralize initial solutions having pH = 3 when adsorbent amount reaches 10 g/l. When the metal solution has a pH value less than 3, it is necessary to use more amount of rice straw to neutralize the solutions.

TABLE (3). Cadmium and Cu removal reported in mg metal sorbed /g.[a]

initial concentration mg/l		adsorbent amount, mg/l		
Cd	Cu	10.0	20.0	40.0
0.25		0.016	0.009	0.005
0.50		0.027	0.017	0.009
1.00		0.057	0.033	0.020
1.50		0.089	0.052	0.030
2.00		0.123	0.073	0.037
	2.00	0.105	0.061	0.046
	3.00	0.175	0.092	0.049
	5.00	0.298	0.164	0.088
	10.00	0.633	0.321	0.161
	20.00	1.313	0.748	0.492

a = Temperature: 25°C, pH :5.0, contact time :15 min and fraction (< 0.5mm).

TABLE (4). Effect of initial pH on Cu adsorption and pH of the final solution.

adsorbent amount g/l	initial pH									
	1		2		3		4		5	
	Final pH	% removal	Final pH	% removal	Final pH	% removal	Final pH	% removal	Final pH	% removal
10	4.34	10.98	7.10	53.12	7.68	60.14	7.25	38.56	7.79	59.86
20	5.99	43.30	7.62	54.02	7.96	59.88	7.66	51.54	7.94	69.82
40	6.96	47.58	7.86	66.52	8.13	61.74	8.01	55.54	8.03	75.75

Effect of Contact Time

The adsorption equilibrium is rapidly achieved and only 5 mins. contacting time is enough to achieve equilibrium conditions (Fig. 5). For 2.0

mg/l Cd at pH 5, with a low amount of adsorbent (10g/l), the removal after 5 mins was 65 % and 45 % for both fractions (< 0.5 mm and 0.5 – 1.0 mm, respectively). The same percentages were obtained after 24 hrs. contacting time. Similar behaviour was observed with copper solution (20.0 mg/l), under the same conditions (Table 5).

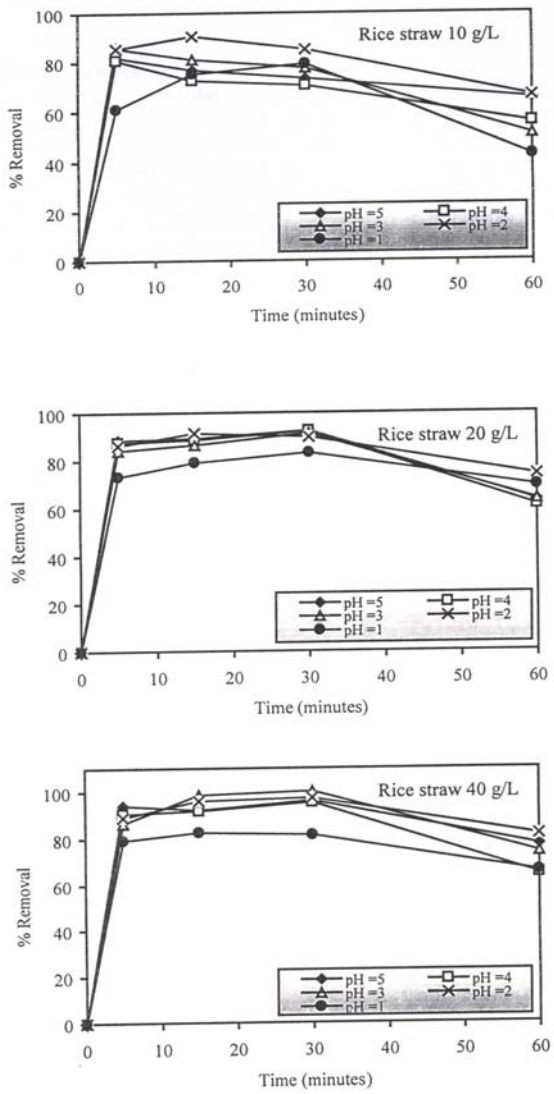

Fig.(4).The effect of pH on Cd removal through rice straw adsorption. Temperature 25C, equilibrium time 1 h and initial concentration: 2.0 mg/L.

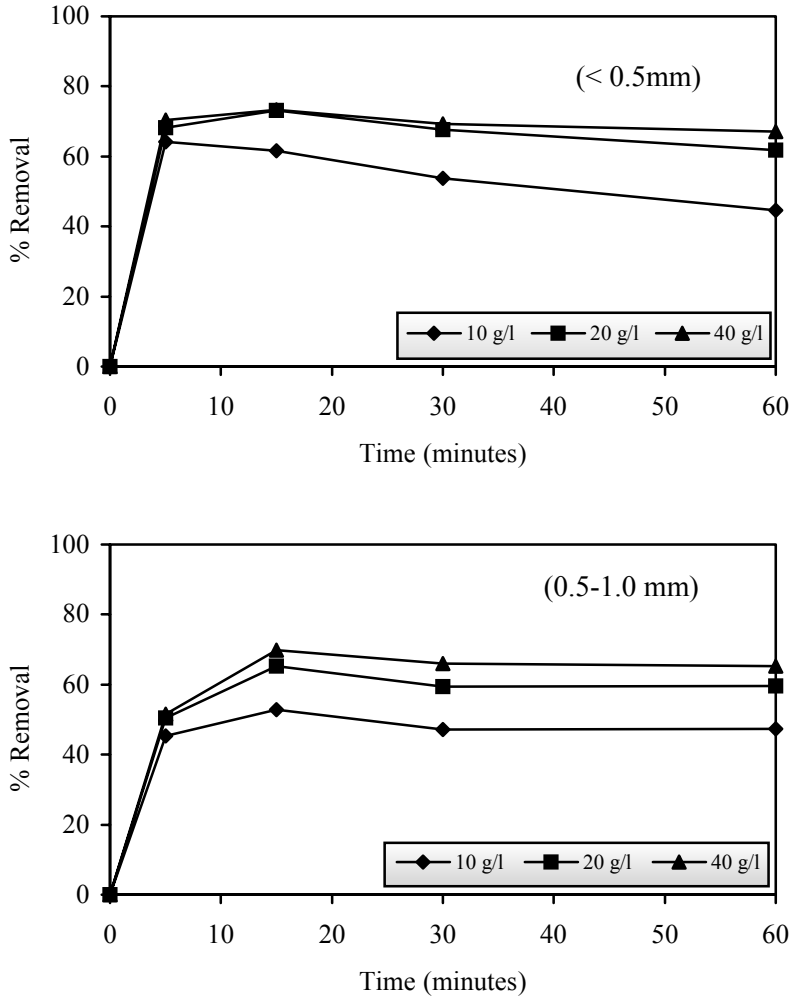

Fig. (5). Sorption kinetic of Cd (II) with different contacting time.

Effect of Adsorbent Amount

The dependence of Cd and Cu sorption on rice straw amount was studied at room temperature by varying the sorbent amount from 10 to 40 g/l, while keeping the other parameters such as pH and solution volume (50 ml) constant.

From this experiment, it is clear that for Cu and Cd adsorption to rice straw was quite similar regardless of magnitude. Firstly, the rate of metal removal is higher at the beginning in all cases, such as rice straw amounts of 40, 20, and 10 g/l, respectively. This is clearly due to the affinity of the rice

straw surface area. Secondly, in a certain time, the percent metal removal reached maximum, it is about 1 hr for both Cd and Cu. Fig. (6) demonstrates this effect and presents a comparison of the two metals, Cd and Cu.

TABLE (5). Adsorption kinetics of Cu and pH of the final solution with different contacting time.

contacting time (mins)	< 0.5 mm						1.0 – 0.5 mm					
	10 g/l		20 g/l		40 g/l		10 g/l		20 g/l		40 g/l	
	pH	% *	pH	% *	pH	% *	pH	% *	pH	% *	pH	% *
5	7.48	50.95	7.81	54.95	7.89	58.85	7.15	21.83	7.29	26.25	7.42	32.24
15	7.47	65.67	7.79	74.83	7.92	98.35	7.04	25.66	7.24	29.70	7.37	43.29
30	7.38	57.88	7.75	63.08	7.86	63.44	7.02	28.41	7.25	39.05	7.36	45.65
60	7.37	63.03	7.67	63.68	7.84	65.44	6.91	30.83	7.12	37.71	7.29	47.39

* = % removal

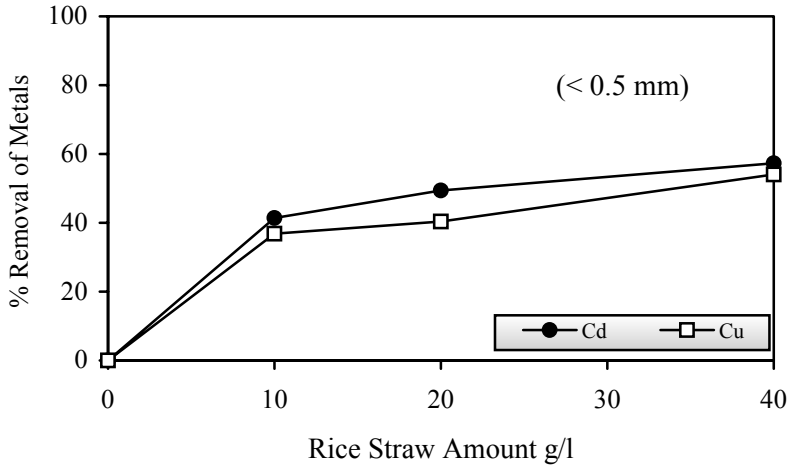

Fig (6). Effect of rice straw amount on the removal of Cd (II) and Cu (II). Initial concentration of Cd and Cu: 2.0 mg/l, contact time: 1 hr.

Effect of Ionic Strength

Ionic strength is one of the most important factors, which has an effect on the aqueous phase equilibrium. Wastewater has many other compounds that can influence metal retention. Data tabulated in table (6) show the effect of ionic strength on metal adsorption. This study was obtained with 2.0 mg/l for Cd and 20.0 mg/l for Cu at 60 mins of contacting

time. Data show no influence on the removal of metal as a result of the presence of these electrolyte concentrations.

TABLE (6). Effect of some substances on Cd and Cu removal and the pH of final solution.

Electrolyte concentration, M		Cd		Cu	
Na_2SO_4	K_2SO_4	pH	%	pH	%
10^{-1} M		7.11	60.22	7.48	65.41
10^{-2} M		7.24	59.95	7.37	64.88
10^{-3} M		7.31	59.74	7.52	63.55
10^{-4} M		7.28	58.86	7.74	63.21
	10^{-1} M	7.26	61.45	7.68	65.11
	10^{-2} M	7.32	61.02	7.62	64.85
	10^{-3} M	7.20	60.75	7.96	64.02
	10^{-4} M	7.22	60.25	7.86	63.58

CONCLUSIONS

Significant data were obtained through this study for the removal of Cd and Cu by rice straw adsorption. Rice straw appears to be a promising adsorbent for the removal of Cd and Cu.

Metal retention using rice straw decreases when the pH of the initial solution decreases. The metal removal mechanism can be described as a neutralizing process. The amount of rice straw is an important parameter. Very acid solutions need more rice straw for neutralization.

The presence of high ion strength does not have a significant effect on the removal of Cd and Cu.

At these adsorption levels, a process using rice straw for the removal of heavy metals is shown to be potentially more economical than current process technology.

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فش الآرR Rالة الاناصر الكفيلة مD المحاليث

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تم دراسة إمكانية إزالة كلا من الكادميوم والنحاس من المحاليل بواسطة قt الأرز، حيث أظهرت النتائN أن قt الأرز يعتبر مادة جيدة لأدمصا f كلا العنصرين وأن السعة الأدمصاصية تزداد بنق f التركيز الOبتدائO للعنصر المدم f ، كما أن عملية الأدمصا f تصل إلى مرحلة الOتزان بعد دقائق قليلة من بداية التفاعل وتتناق f بدرجة ملحوظة بعد ساعة واحدة.

وتوضO ظاهرة إزالة العناصر أن قt الأرز يعمل علO معادلة المحاليل نظرا لطبيعتN القلوية ، كما أوضحت النتائN أن وجود الأيون المصاحب لم يCر علO عملية الأدمصا f لكلا العنصرين بواسطة قt الأرز فO حين أن تأيير رقم الحموضة كان واضحا.

الموارد المائية للبناء القومي في شبه جزيرة سيناء

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ملخص

" الماء انا شاء حاً " صدق الله العظيم

تعتبر المياه في الصحراء هي عصب الحياة ، فهي المصدر الاساسي للمعيشة وأساس التجمع الانساني ،هي ايضا مصدر الصراع والتعاون فالبيئة الجيولوجية هي العامل المحدد لنوع الحياة في الصحاري المصرية لانها المصدر الوحيد المحدد للنشاط الاقتصادي والاجتماعي.(علية حسين ، ١٩٩٤)

ومع عوده سيناء بوابة مصر الشرقية وقاعدة انطلاق تبادل وامتزاج الحضارات والثقافات المصرية والعربية و الفارسية وهي محطة العبور والالتقاء لشعوب العالم القديم في اسيا وافريقيا وكانت واحة الامن والامان و الانطلاق للرسل والرسالات والاشعاع الحضاري والتماذج الفكري والروحي بين دول وشعوب المنطقة ، واقسم الرب الكريم بمعالمها المتميزة في طور سنين ، فاستحقت كل الحب والعناية والرعاية والتقديس ، وتبلغ مساحة شبه جزيرة سيناء ٦١ الف كيلو متر مربع أي حوالي ٦% من مساحة مصر ، وتتميز سيناء بتساقط الامطار عليها شتاء وقد تحدث بعض السيول والامطار الرعدية في الخريف والربيع وعلى الاخص على سلاسل جبال الجنوب ،وكما يبلغ معدل المطر السنوي في الجنوب حوالي ٢٥ مم ، ويصل في اقصاه الى حوالي ٢٠٠ مم في الشمال عند العريش تزيد كلما اتجهنا شرقا إذ قد تصل الى ٣٠٠ مم عند رفح ، وتنحدر مياه الأمطار التي تسيل في الوديان في المناطق الشمالية الى البحر الابيض المتوسط وفي المناطق الجنوبية الى خليجي العقبة والسويس و يتسرب جزء منها الى باطن الارض لتغذية الخزانات الجوفية(وزارة الأشغال العامة للموارد المائية ، ١٩٩٣: ١٩٩٥)

ولذا اتجهت الانظار لمساحة سيناء الشاسعة ومواردها الطبيعية ومصادر مياهها لتمتد اليها يد التعمير لترسي قواعد مجتمع جديد يعمر بالسكان وليكن موردا يكمل موارد الثروة بمصر لتعمر بالخير والنماء على الدوام ، ونظرا لما تمثله الموارد المائية من أهمية بالغة في كافة مجالات الحياة مثل مشروعات الري والتنمية الزراعية والسياحة وغيرها فان العلاقة بين المياه والتجمعات العمرانية علاقة ذات اثر فعال في استمرار الحياة وتقدم مظاهرها المختلفة في هذه التجمعات من خلال خطط طموحة وبرامج مكثفة بهدف تحقيق التنمية الشاملة في سيناء في مختلف المحاور والاتجاهات .

مشاكل البحث

تتميز الصحاري بالبداوة التي تلعب الظروف البيئية القاسية دوراً هاما في الحراك المكاني والبناء الاجتماعي والعلاقات الاجتماعية ، فنرى اثر النسق الايكولوجي وعلاقته بالنسق الأجتماعي وارتباط ذلك بنوع الملكية وطبيعتها ، وتعمل القرابة على تحديد شكل الملكية ، ويعتبر نظام الملكية عاملا من عوامل تماسك البناء الاجتماعي ، فالنظام يوجه نحو اشباع حاجات معينة ، وعلى الرغم من أن الملكية تعتبر مصدراً للصراع ، فأن الصراع يلعب دورا هاما في توحيد الجماعة من اجل مواجهة الظروف البيئية ، فهو رباط قوي أكثر منه قوة ممزقة ، فالنظام الاجتماعي هو المنظم للنضال من اجل الوجود فوظيفة الملكية من وجهة النظر الاقتصادية هي

ايجاد علاقة بين مصادر البيئة وقوى السكان لتحقيق أقصى انتفاع للاستمتاع بالثروة ، ونظرا لندرة المياه فى البيئة الصحراوية من هنا كانت لها أهمية كبرى كمورد رئيسى فهى المصدر الأساسى للحياة ، ولذا تعطى ملكية المياه حق الانتفاع بالأرض فى زمام مصدرها ، كما تعطى المياه حق تملك انواع اخرى من الملكيات ، ولهذا كان لنظام ملكية المياه دور فعال فى تحديد النفوذ والقوى والسلطة داخل المجتمعات البدوية .

من هنا كانت فكرة هذا البحث لما للمياه من أهمية عظمى واثرها على بناء القوى فى المجتمع السيناوى وبجانب ذلك لم توجد دراسات عن اثر المياه على بناء القوى ومن هنا كانت مشكلة البحث .

أهمية الدراسة

ولهذا البحث أهمية تتمثل فيما يلى :

أ- الأهمية التطبيقية

- هو الكشف عن مجتمعات وفرة المياه وندرة المياه فى شبه جزيرة سيناء حيث أن هناك مناطق تتوافر فيها المياه من امطار و ابار و سيول واخرى تندر فيها المياه حيث قلة الأمطار وعدم وجود الخزانات الجوفية أو بعدها عن سطح الأرض أو عدم صلاحيتها للاستخدام الآدمى والأنشطة الخاصة به .
- القاء الضوء على المجتمع البدوى الذى يتميز بالنسق القبلى والبناء الوظيفى الذى تحكمه الروابط القبلية والتضامن الأسرى ومدى ارتباط بناء القوة بالأصول القبلية التى تعد عنصرا أساسيا فى توريث المكانة فى المجتمع البدوى وهذا مع دوام الأرتباط بالتقاليد ولذا كان لابد من دراسة العوامل المؤثرة على بناء القوة داخل المجتمع السيناوى .
- التعرف على اثر توافر المياه على المكانة الاجتماعية التى لابد أن تعتمد على حيازة الأفراد للجوانب المادية السياسية والثقافية واثرها فى بناء القوة والسلطة النفوذ فى المجتمعات الصحراوية واستخدام ذلك فى النهوض من خلال عمليات مخططة تستهدف التنمية فى تلك المجتمعات .

ب- الأهمية العلمية

- يعتبر هذا البحث من البحوث النادرة التى تلقى الضوء على الدور الفعال والهام من خلال نظرة شمولية لأثر بناء القوة والسلطة التى تعتمد على الظروف الأيكولوجية والاجتماعية داخل المجتمعات الصحراوية .

أهداف الدراسة

من استعراض البحوث السابقة فى هذا المجال امكن تحديد اهداف الدراسة الحالية الى :

- التعرف على البيئة الصحراوية ومواردها الطبيعية وأثرها على حياة البدو فى بناء القوة الاجتماعية والسياسية والثقافية والمادية .
- الوصول الى أهمية البناء القبلى والمتغيرات الاجتماعية ودورها فى بناء القوة بالمجتمعات الصحراوية .

الفروض

- الفروض الرئيسية الآتية :

يوجد فروق دالة بين مجتمعات وفرة المياه ومجتمعات ندرة المياه فى بناء القوى وتتفرع الى فروض فرعية هى :

- هناك فروق دالة إحصائيا بين مجتمعات وفرة المياه ومجتمعات ندرة المياه فى ملكية مصادر المياه ، ملكية الأراضى ، حفظ النسب ، الجوانب المادية ، الجوانب الثقافية و الجوانب السياسية فى مستوى بناء القوى .

ب – الفر f الرئيسيآ الثانيآ

يوجد فروق دالة بين بعض المتغيرات الاجتماعية وبناء القوى وتتفرع الى فروض فرعية كالتالى :

č – هناك فروق دالة احصائياً بين : النوع ، الحالة الزواجية ، المهنة ، العمل الاضافى ، الدخل و التعليم فى مستوى بناء القوى .

المفاهيم

مفهوم بناء القوة Power Structure

هى علاقة القوة الرسمية وغير الرسمية فى مجتمع معين ، التى تحدد القرارات والأفعال الكبرى ولهذا فأن بناء القوى هو أكثر من مجموع القادة الرسميين والبناء السياسى المعترف به ، لانه يشتمل بين ما يشتمل على الأفراد المؤثرين أو ذو النفوذ وكذلك جماعات المصلحة (محمد عاطف ، čěě : ďĐĐ)

مفهوم القوة Power

القوة بمعناها العام تشير الى القدرة على فرض الارادة أو هى قدرة جماعة أو شخ f على التأثير وممارسة النفوذ على سلوك الاخرين عن طريق وسائل معينة و احيانا يستخدم مصطلح القوة كمرادف لمصطلح القوة السياسة الذآ يعنى السلطة السياسية او القوة القانونية للدولة . وتعنى ايضا هى قدرة الفرد أو الجماعة على تنفيذ رغبة أو سياسة أو ضبط واحتكار سلوك الاخرين أو التأثير فيهم ، سواء ارادوا التعاون او رفضوه، ولهذا لا بد أن يكون عند من يمتلك القوة المصادر التى تجعله قادر على فرض ارادته (محمد عبده ، ď : čĐĒ)

المفهوم الاجراآ لبناء القوة

حيث تعنى ما يكتسبه الفرد من خلال الادوار المرتبطة بمتغيرات القوة لمكانه داخل المجتمع البدوآ فنجد مثلا أن حيازة بعض الجوانب المادية (كالارض – مصدر مياه – المال والثروة) تعطى مكانة اجتماعية أو قد يعطى التعليم والثقافة قدراً من المكانة الاجتماعية فى المجتمع أو قد يكسب البعض الدور السياسى القوة والمكانة لما لها من تأثير قانونى داخل المجتمع. وقد ترتبط ايضاً المكانة الاجتماعية والقوة بالنسب والانتماء الى اصول قبلية ذات عراقة فى المجتمع .

المفهوم الاجراآ للموارد المائية

وتعنى الباحثة بالموارد المائية فى هذا البحث هى مصادر المياه التى تقوم عليها الحياة فى البيئة الصحراوية والتى تعتمد عليها المناشط الأخرى فى المجتمع البدوآ السيناوآ وتعنى مصادر المياه بالآتى:

- مياه الأمطار
- مياه السيول
- مياه الآبار
- مياه العيون

الدراسات السابقة

تعددت الدراسات والبحوث المتعلقة بالموارد المائية فى شبه جزيرة سيناء وتعتبر هـذه الدراسة من الدراسات النادرة فى اظهار العلاقة بين الموارد المائية وبناء القـوى داخـل البنـاء الاجتماعى البدوآ وسوف نتناول فيما يلى بعض من هذه الدراسات .

č – الدراسة الاولى

قام معهد بحوث الموارد المائية (١٩٩٦) بدراسة توفير المصادر المائية لتوطين واستقرار البدو بوسط سيناء ČěěĒ وتهدف الدراسة الى استقرار بدو سيناء وايقاف الهجرة من

جنوب ووسط سيناء و استزراع الأرض الصالحة للزراعة من خلال انشاء الآبار الجوفية الضحلة والعميقة فى المناطق المختلفة و انشاء السدود الترابية بالسعة المناسبة وكذا انشاء الخزانات الأرضية لتخزين مياه السيول والأمطار وتتفق هذه الدراسة مع الدراسة الحالية فى التعرف على مصادر المياه و استقرار البدو حولها فى سيناء .

ج – الدراسة الثانية

قام بها إسماعيل على محمد عطية (١٩٩٥) والتى تهدف الى دارسة اثر الجوانب الاجتماعية والسياسية ودورها فى بناء المكانة الاجتماعية والسلطة والقوة داخل المجتمع المصرى حيث اكدت النتائج أن المكانة الاجتماعية تعطى نتيجة ايجابية لصالح الافراد و اصحاب الادوار السياسية فى المجتمع المصرى منذ مطلع هذا القرن وتتفق مع الدراسة الحالية فى اظهار دور الجوانب الاجتماعية والسياسية فى بناء المكانة الاجتماعية .

د – الدراسة الثالثة

قام بها محمد ابراهيم محمد عبد النبى (١٩٩٩) وكانت هذه الدراسة تهدف الى التعرف على المتغيرات الاجتماعية المؤثرة على المكانة الاجتماعية من خلال الادوار فى القرية المصرية . وأكدت الدراسة أن هناك العديد من التحولات الاجتماعية واثرها فى تحديد المكانة الاجتماعية مثل زيادة التعليم – زيادة الدخل - الحراك الاجتماعى ، كل هذا ادى الى تحديد الادوار لبناء القوى داخل القرية المصرية وتؤكد هذه الدراسة أن هناك بعض العوامل التى تحدد المكانة الاجتماعية داخل المجتمع مثل التعليم والجوانب المادية ولكنها اختلفت عن الدراسة الحالية من حيث منطقة الدراسة ومجتمع البحث .

هـ – الدراسة الرابعة

تشير الدراسة التى قام بها Cotgageorze and Whitehead (1988) لأهمية مراعاة البعد الاجتماعى عند التخطيط لإدارة المياه بمعنى أن فى مناطق ندرة المياه بوجه خاص لا بد من مراعاة البعد الاجتماعى عند اختيار المستوطنين الجدد بحيث يكون بينهم تجانس و بينهم صلات قرابة حتى يتم تعاونهم على ادارة الموارد المحدودة كالمياه و إلا سوف تتعدد الصراعات إلى المزيد من اهدار المياه و سوء استغلالها و قلة العائد الاقتصادى و تفيد هذه الدراسة فى تأكيد ضرورة التركيز على بناء القوى و اصحاب النفوذ والسلطة ليكون لهم دور فى المشروعات التى تقام فى مناطق ندرة المياه و حماية هذه الموارد من الاهدار والاستفادة منها بأكبر قدر ممكن. وتتفق هذه الدراسة فى تحديد ادارة المياه فى مناطق ندرة و وفرة المياه و أثر الأبعاد الاجتماعية على تكوين المكانة الاجتماعية .

رؤية نظرية لمشكلة البحث

التأصيل النظرى

تحدد الظروف الايكولوجية نوع الملكية وطبيعتها ، وتعمل القرابة على تحديد شكل الملكية ، فحقوق الملكية متاحة فى المتجمعات البدوية ، ويعتبر نظام الملكية عاملا من عوامل تماسك البناء الاجتماعى ، فأنها يشبع احتياجات معينة ، كما يقتضى وجود اتفاق عام فى المجتمع على فئة معينة عن القيم التقليدية التى تجمع بين الافراد ، ولذا يتميز نظام ملكية المياه بالتعقيد الشديد لأنها مرتبط بملكية الأرض وانواع اخرى من الملكيات ، فقد كانت القيمة الاقتصادية للمياه ترتبط ارتباطاً وثيقا بقيم القرابة ، حيث تعطى ملكية المياه كلا من الفرد والجماعة مكانة اجتماعية عالية داخل المجتمع و يستند نظام ملكية المياه على التعاون والتضامن لمواجهة الظروف البيئة القاسية(علية حسين ، ١٩٩٥: ٤٤) ويعد عامل الملكية عاملاً رئيسيا ضمن عوامل اكتساب السلطة والنفوذ والحظوه بين المجتمع و يرجع هذا الى أن المكانة والوضع الآمن لبناء القوة المؤثرة صاحبة الثروة يجعلها قادرة على السيطرة السياسية والاجتماعية والاقتصادية على اعتبار أن الثروة التراكمية (لبيبة موسى ، ١٩٩٥ : ١٩٩٥) ولذا كان لا بد من اظهار الأسس النظرية التى تخرج عنها هذه الدراسة .

Č – نظرية التحدي والاستجابة Theory of response and challenge

حيث فسر توينبي ظهور البداوة التي هي استجابة لظروف طبيعية تتمثل في عدم توفر الماء في فصل من الفصول و انخفاض درجة الحرارة شتاء وعدم وجود النباتات الطبيعية مما يعني عدم توازن الغذاء الطبيعي للحيوان بالإضافة الى العامل البشري الذي يتمثل في الموروثات الاجتماعية التي تناقلتها الاجيال من تحدي الجفاف الذي وجد الانسان زارعاً فشطر مجتمعه الى جزئين : الأول انتجه الى المناطق الرطبة ليواصل زراعته ، والثاني توغل في الأماكن الجافة مع حيواناته (محمد عبد السميع ، ČĚč : Ěě)

č – نظرية الندرة والقوة Theory of power , scarcity

فرض وضعة روبرت ليند خلاصته أنه لا يوجد في المجتمع غير قدر محدود من القوة متاح للاستخدام – وبناء على ذلك ، إذا ضاعفت احدى الجماعات في المجتمع امتيازاتها وقوتها ، فسوف يؤثر هذا تأثيراً مباشراً على قوة الجماعة الأخرى . والعكس صحيح ،اذا فقدت جماعة ما سلطتها أو قوتها ، فانه من المتوقع على الفور أن جماعة أخرى سوف تحتكر القوة المفقودة ، كما اشار " بارسونز " إلى هذه الفكرة عندما رأى أن أية زيادة في قوة شخ f ما ، او تحسن في وضعه فيما يتصل بعامل معين ، يؤدي بالضرورة الى تناق f في قوة شخ f أو اكثر من الأشخا f المشتركين معه في نفس الوقت (Robert, S.L , 1975 : 132)

Ď – نظرية التفاعلية الرمزية Symbolic Interactionism

وهي اتجاه يصور الاحتمالات الممكنة التي تواجه عملية التفاعل بين الأفراد ، وبخاصة فيما يتعلق بتكوين الذات ، ويمثل هذا الاتجاه جورج "هربرت وبلومر" – فالتفاعل الانساني في رأيهما هو عملية تكوين ايجابية لها اسلوبها الخا f وتنظر هذه النظرية الى كل سلوك أو فعل مستمر بين شخصين على ان له تاريخه الخا f ، ولنتظامه وتكراره علي أساس التوحد أو التعريف المشترك للموقف بين هذين الشخصين وهذا يؤكد عمليات التفاعل بين الأفراد في امتلاك بعض الموارد الطبيعية في المناطق الصحراوية وتكوين السلطة و النفوذ فيها (محمد عبد السميع ČĚč) .

مصادر المياه في سيناء

يسيل من جبال سيناء ومرتفعاتها في زمن الأمطار أودية شتى تصب في البحر المحيطة بها أو تعترضها صحاري من الرمال ، وأودية سيناء هي حياتها ففيها تسيل الانهار وتتفجر العيون و ينبت العشب والشجر ، وبها مساكن البدو ومزارعهم ومراعي ابلهم واغنامهم ،وجميع طرق البلاد تمر فيها فتقطعها أو تسير معها ويختلف اتساع الوادي في مجراه من بضعة امتار الى الف متر أو اكثر وارتفاع جانبيه من متر أو اقل الى الف متر أو اكثر. ومعظم الأودية ارتفاعا من جانبيها ، واودية بلاد الطور فهي تسير متعرجة بين جبال شامخة .

ويدوم السيل في الأودية بضع ساعات بعد انقطاع المطر ثم يجف . وليس في الجزيرة كلها نهر واحد حي ولكن في بعض أوديتها ينابيع ماء أو اباراً حية أو وقتية تجمعها في اصطلاحهم الرؤوس الآتية وهي :

(العين) وهي نبع ماء يجري ماؤه فوق الأرض صيفاً وشتاءً .

(العد) جمعه عدود و تصغيره عديد وهو نبع حي في حفرة فلا يجري ماؤه فوق الأرض ويقال له الثمد و جمعه ثماده .

(البئر) وهي ما يفرز ماؤها في الصيف اذا لم يقع مطر في الشتاء .

(الثميلة) وهي حفرة قريبة الغور يظهر فيها الماء ثوا بعد المطر و تنشف في الصيف إلا اذا عزر المطر جداً في الشتاء .

(المشا ţ) جمعه امشة وهي ضعيفة ينشف في الصيف قبل التميلة .

(الصنع) هو سد صناعÖ من تراب يحفرونÑ فÖ طريق السيل لجمع مياه الÙمطار و يطهرونÑ كل سنة .
(السد) وهم يحيلونÑ فÖ مجرى الواد Ø لحبس المياه فÖ زمن الÙمطار
(المكراع) وهو بركة طبيعية بين صخور الجبال تتجمع فيها مياه الÙمطار .
(الهرابة) بركة صناعية فÖ مجرى السيل لخزن مياه الÙمطار فÖ زمن الصيف وهÖ أما نقر فÖ صخر أو بناء بحجر .
(الحمام) وهو نبع كبريتى مÙل حمام موسى وفرعون (نعوم بك شقير đ : ČĐ)

ملاية jÑادار Ø المياه بيÞ القباÙÜ

نجد لكل قبيلة مراع ومياه واراضÖ زراعية معروفة ، أما المراعÖ والمياه فمشاع لجميع القبائل فلا تمنع قبيلة قبيلة أخرى عن مراعيها أو مياهها الÙ فÖ زمن الحرب .

وأما الÙارضÖ الزراعية فهÖ ملك لأفراد القبائل فلا يتعرض احدهم لأرض غيره ولÙ يزرعها إلÙ بأذنÑ ، وفÖ عرفهم أنÑ اذا اكتشف احدهم ماء لم يكن معروفا او احتفره فÖ مكان لم يكن فيÑ من قبل اصبÞ الماء ملكا لÑ واقام بجانبÑ رجما ووسمÑ بوسمÑ . وأن كان يقرب الماء ارض صالحÑ للزراعة استولى عليها وزرعها لنفسÑ، هذا اذا كان فÖ ارض قبيلتÑ اما اذا كان فÖ ارض أجنبية حق لÑ الÙنتفاع بÑ كغيره من أبناء القبيلة التÖ وجد الماء فÖ ارضها ولم يكن لÑ حق بالÙرض التÖ حولها (ابراهيم امين غÙالÖ ، ČĕēĒ : ČČĎ)

وتتأثر التجمعات السكانية الى حد كبير بوجود الÙبار ، كما أن جفاف البئر أو عدم صلاحيÑ مياهÑ لزيادة نسبة الÙملاØ مÙلا تعنÖ البحث عن بئر اخرى صالحة للاستعمال ومياه الÙبار كانت ولÙ تزال الى يومنا هذا تمÙل نوعاً من الملكية سواء كانت ملكية قبلية أو عائلية أو فردية ، ومياه الÙبار حق مشاع للجميع حيث يسقط من ملكية قبيلة أو عائلة ما ،كما أن مياه الÙبار حق مشاع للجميع حيث يسقط المطر و يعم الخير .

ولÙ شك أن الزراعة والحياة النباتية والرعÖ تتأثر الى حد كبير بسقوط الÙمطار التÖ لÙ تستقر على حال وهذا بدوره كان العامل الÙول الذ Ø جعل مهنة الموالة والرعÖ الحرفة الÙولى فÖ النشاط البشر Ø لدى البدو وادى الى وجود الهجرة الموسمية الى اراضÖ معينة فÖ فترات الجفاف للحصول على العشب و الكلا لماشيتهم (محمد أحمد غنيم ، Čĕĕē:ĐĎĔ)

الدjÑر الÙقتصادÖ للمياه فÖ Ø المجتمÞ الحينjÑÖ

نجد أن هناك العديد من الزراعات التÖ تعتمد على الÙمطار منها الفاكهة التÖ تتمÙل فÖ الخوÙ ، اللوز ، التين ، العنب والرمان والخضر مÙل البطيÙ البعلÖ . ومن المحاصيل مÙل القمÖ والشعير ، والعدس ، كما توجد الزراعات القائمة على المياه الجوفية والنشع والمياه المنقولة ، وهÖ تتمÙل فÖ زراعات الفاكهة خاصة الزيتون والموالÖ والخضر وهÖ قائمة على الÙبار العميقة . كما أن الزراعة القائمة على العيون الطبيعية تتمÙل فÖ الخضر والفاكهة .

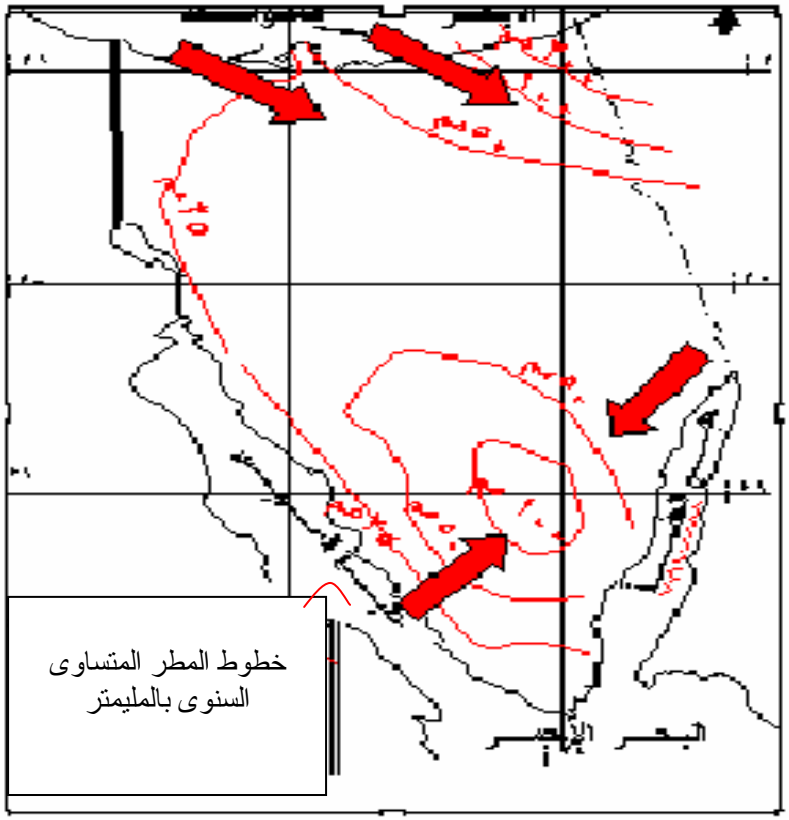
وايضا هناك الزراعات القائمة على مياه السيول والتÖ تتم اجلبها عن طريق اقامة سدود ترابية لحجز المياه واستخدامها فÖ زراعات القمÖ و الشعير وبعض الأذره الرفيعة (مركز المعلومات ، محافظة شمال سيناء ، ČĎČČČ)

هذا بجانب الÙعتماد فÖ الرعÖ على النباتات التÖ تنمو نتيجة الÙمطار والسيول فÖ الوديان وتحت سفوØ الجبال حيث يتراوØ المطر فيها بين ČČđ– ČČČ مم فÖ المنطقة الساحلية الشمالية و đČ-ČČمم فÖ المناطق الداخلية فÖ الشمال ، تتزايد كلما اتجهنا شرقا وتتناقÙ كلما اتجهنا جنوبا . أما فÖ جنوب سيناء فالأمطار قليلة على ساحلÖ العقبة والسويس بينما تتزايد على المرتفعات كما توضÖ ذلك الخريطة التالية (شكلČ) .

الدور الاجتماعى للمياه فى بناء القرية

فقد ارتكزت الحياة البدوية على قيم وعادات ونظم وليدة الظروف الاقتصادية ، وهى نتيجة حتمية للعوامل الطبيعة البيئية التى اجبرت سكان الصحارى أن ينضموا الى بعضهم البعض فى شكل قبائل وبطون وافخاذ ليكونوا قوة جماعية تحميهم من المخاطر والاعتداءات الخارجية حتى يمكن أن يحافظوا فى النهاية على حياتهم وأرواحهم الحيوانية فى نطاق العزلة شبه التامة (نافع ناصر القضاب ، ١٩٩٥ : ٢٠٢)

وتكون العائلات المتمايزة تجمعات قروية مؤقتة فى فصل معين من فصول السنة كفصل الامطار ،ولكن عناصر هذا التجمع تتبعثر فى فصل اخر سعيا وراء المراعى والموارد المائية المحدوده فى فصل الجفاف (محمد عبده محجوب ، ١٩٩٢ : ٢٢٥)



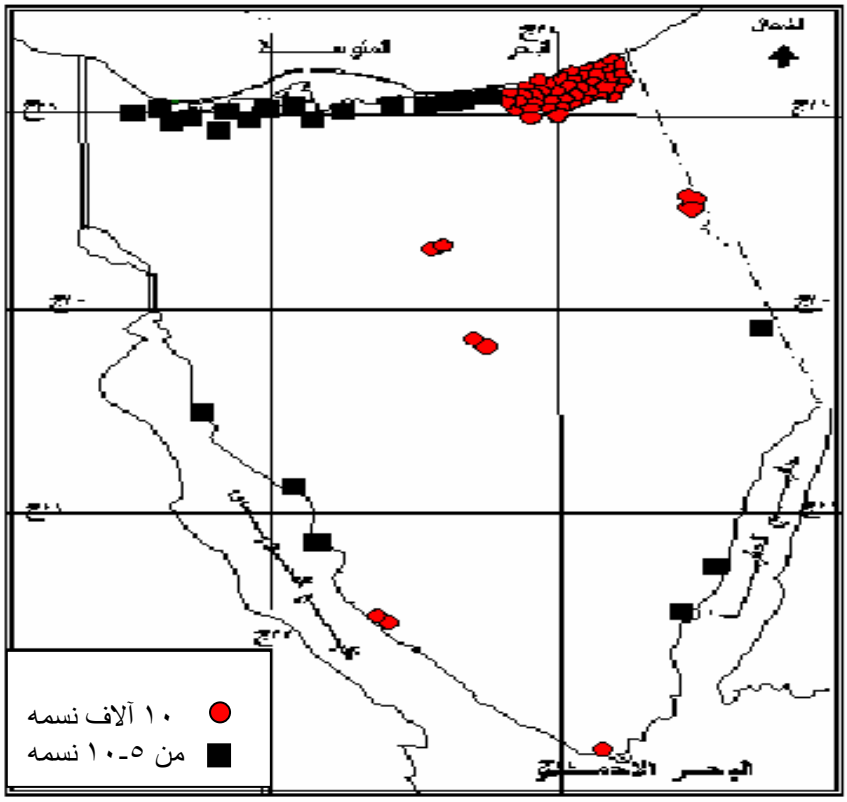
شكل (١). خريطة توضح توزيع الامطار فى شبه جزيرة سيناء

ولذا نجد أن القيمة الاقتصادية للمياه ترتبط ارتباطاً وثيقا بقيم القرابة حيث تعطى الملكية للمياه كلا من الفرد والجماعة مكانة اجتماعية عالية داخل المجتمع ، كما كانت تفرض تقديم المساعدة فى العمل الزراعى لمن يحتالا إليه من الأقارب، فالقيمة الاقتصادية هنا مرتبطة بنتالا البئر .

ويستند نظام ملكية المياه على التعاون والتضامن لمواجهة الظروف البيئة والجغرافية، وبالتالى تكون هناك علاقة وثيقة بباقى النظم المكملة للبناء الاجتماعى . إذ يتوقف المركز الاجتماعى والسياسى والسلطة والنفوذ بوجه عام على ما يحوزة الشخص أو جماعتة القرابية من ممتلكات يقدرها المجتمع .

وقد وجد أن الملكية فى المجتمع المدروس تنصب على تملك الأراضى والمياه الى جانب رؤوس الأغنام والمال والتجارة ، كما يمثل الانحدار الفرابى والأصول القبيلة عنصراً اساسيا فى توريث المكانة الاجتماعية وهو يرتبط ارتباطا وثيقا ببناء القوة حيث يخضع المجتمع لنظام توريث المكانة الاجتماعية لأعضائة هذا على دوام الارتباط بالتقاليد والمحافظة على الماضى ودوام استمراريتة (أحمد أبو زيد ، ١٩٩٨ : ٢٥٦)

حيث يبلغ عدد سكان سيناء ٤٣٠٠٠٠ نسمة وفقا لتقدير سنة ٢٠٠٠ من مركز المعلومات بالمحافظة ، ويمكن أن نميز منطقتين واضحتين لتجمع السكان الأولى : السهل الساحلى الشمالى حيث العريش ورفح والشيخ زويد وبئر العبد والقنطرة شرق والتى يتركز بها حوالى ٨٠% من عدد السكان ، أما المنطقة الثانية فيتوزع بها باقى عدد السكان فى الوسط و دلتاوات الأودية والسهول الساحلية التى تطل على خليجى العقبة والسويس كما توضح الخريطة التالية (شكل ١) لتوزيع التجمعات السكانية فى سيناء .



شكل (٢). خريطة توضح توزيع السكان فى شبه جزيرة سيناء

دور المياه الاجتماعي في بناء القوة

تلعب التنشئة الاجتماعية دوراً بالغ الأهمية في غرس وتأصيل العوايد والنظم البدوية في نفوس وسلوك اعضاء الجماعة القبلية ، فعلى الشبان أن يتعلموا احترام القرارات التي ارتضاها " عواقلهم " و إن كان عليهم أن يقفوا دائما على استعداد للحروب القبلية لغرض حقوق العشيرة التي ينتمون اليها ، ويجلس الشبان على مقربة من مجالس الصلح دون أن يشاركوا في النقاش ليتعلموا كيف تسوى المنازعات حول الأرض وموارد المياه و الاعتداءات المختلفة .

وكثيرا ما ترتبط الزعامة السياسية الدينية بالوراثة حيث يورث الزعيم من يراه على كفاءة ببيئته من اولاده علمه واعطاه خبرته في القضاء البدوي (صلاح الفوال ، 1985: ٤٤٦) ويعد عامل الملكية عاملا رئيسيا ضمن عوامل بناء القوة ، ويرجع ذلك الى الالتزامات المفروضة عليهم والتي تساعدهم على الوفاء بها بما يحوزون من الثروة المدعمة للمكانة ، ويظهر ذلك في المناسبات المختلفة كاكرام الزوار والضيوف و اصحاب المشاكل والوافدين المشتركين في اجتماعات أو مناسبات عامة أو خاصة ففي تلك المجتمعات يقوم القادة الطبيعيين الذين يؤدون وظائف هامة في هذا المجال ، ويقومون بعمل مزدوج فيما يختص بالاداب العامة السارية في مجتمعاتهم ، ويعملون على حماية التقاليد والقيم التقليدية والتراث الاجتماعي الموروث ، ولذلك فان الجماعة تلجأ لهؤلاء الأفراد ذوي القدرات الخاصة ، والقدرة على الاقناع و التأثير العام بدور الوساطة والتحكيم ووضع الحق في نصابه ، معتمدين على مكانتهم و قدراتهم في التوفيق بين المصالح المتنافرة .

دور المياه الثقافي في بناء القوة

تتكامل الخبرات البدوية لتكون نسقا عاليا من الثبات تطلق عليها "الثقافة البدوية" التي تنطوي بالتأكيد على نوع من التنظيم والفهم المشترك بين أعضاء المجتمع البدوي كما أنها كفيلة بتقديم حلول مرضية لكل مشكلات الانسان البدوي منذ الميلاد حتى الممات (شاكر مصطفى سليم ، 1990 : ٤٤)

تواجه المجتمعات البدوية أوضاعا ايكولوجية عالية من الصعوبة، فنزول الأمطار تتفاوت معدلاتها إلى حد كبير، وكثيراً تتعاقب سنوات الجفاف التي يموت فيها الزرع ويجف الضرع وتضطر فيها الجماعة القبلية إلى الهجرة أو التبعثر في مناطق متباعدة – أو الاعتماد على مصادر المياه الجوفية التي تستغل بطرق بدائية تؤدي إلى نضوبها وارتفاع نسبة الملوحة فيها ومن هنا تنتهي إلى هجرة جانب من السكان إلى أوطان وموارد مائية جديدة، ولذا نجد العرف هو الذي يحكم القضاء البدوي للحد من المنازعات حول حقوق استغلال الموارد والتعديات عليها (عباس الفراوي ، 1988 : ٤٥) كما نجد أن الخبرات المالية الذاتية للفرد داخل المجتمع التقليدي قد تعطي له مكانة فمثلاً التعليم وأثره على بناء القوه حيث أجرى باريتو مقارنة بين عنصر الثروة عنصر التعليم، ورجح باريتو عنصر التعليم لما تضيفه على الفرد من أفكار جديدة هدفها التجديد والابتكار وتعطيه خصائص فكرية تعطيه مكانة أعلى لما اكتسبه من مهارة كحصيلة العلم (Pareto, 1963)

ولما للبيئة من أثر على حياة البدو نجد أن قبائل السوارك والرميلات وهم اغنى بدو سيناء يسكنون في عشش وقلما يعيشون في خيام الشعر او الوبر كما يسكن البدو الآخرون (نبيل صبحي حنا، 1988 : ٤٥) وهذا ليكونوا أكثر قدرة على الترحال وراء الماء والمطر فقد ذكر الشيخ صلاح قابل من السوارك وهو موظف في التربية والتعليم ومزارع أن في شهر ديسمبر-يناير في حالة هطول الأمطار يهاجر أهالي الشمال من المزارعين إلى منطقة الوسط لزراعة القمح والشعير حيث الأرض الخصبة وهطول الأمطار فتعطي إنتاجا وفير في مناطق (الحسنة والقسيمة-المنبطح – والشيخة- وأم شيحان – شرق الحصن – العريفة – الحصانة والمناطق المجاورة) ويعودون بعد الحصاد وهذه الأراضي التي يزرعونها ملكية خاصة لبعض القبائل وتتم المشاركة

عليها من أهالى الشمال ومن هنا كانت أهمية الجانب المادى فى الثقافات الصحراوية والتى تظهر فى شكل المسكن والأدوات الحياتية التى تسهل عمليات التنقل والترحال لملائمة الظروف الصحراوية الصعبة سعيا وراء المياة والرزق .

الإجراءات المنهجية

هذه الدراسة من الدراسات أو البحوث المسحية الوصفية التحليلية وهى تهدف إلى كشف موضوع معين عن طريق جمع المعلومات من خلال المسح الإجتماعى بالعينة الذى يخدم الدراسة الوصفية ويدعمها منهج دراسة الحالة وهذا يلائم البحوث الأجتماعية التى تهدف الوصول إلى صورة متكاملة لإطار مجتمعى معين.

مجالات البحث

أ – المجال البشرى: عينة قوامها ٢٠٠ مفردة تمثل مجتمعات وفره وندرة المياه وعينة من رؤساء القبائل والمشايخ وأعضاء المجلس المحلى – وبعض الوجهاء وبعض مالكى الأراضى والآبار.

ب – المجال الزمنى: تم اجراء البحث من خلال شهر اغسطس سنة ٢٠٠٠.

ج – المجال المكانى: محافظة شمال سيناء وجنوب سيناء على عينتان متماثلتان لمجتمعى وفرة وندره المياه فى سيناء.

أدوات البحث

اعتمد البحث على عدة أدوات أهمها استمارة استبيان من ٤٠٠ سؤال فى جوانب مختلفة عن بناء القوه بجانب مقابلة مقننة ومناقشة جماعية لعشرين دراسة حالة تمثل مجتمعات وفره وندرة المياه فى سيناء – حيث تضمنت الإستمارة فى ضوء الإطار العام لموضوع الدراسة جميع النقاط الرئيسية والفرعية التى يشتمل عليها البحث.

أهم المشاكل التى واجهت فريق البحث أثناء الدراسة الميدانية

- صعوبة التضاريس بين المناطق المختلفة وخاصة فى الجنوب .
- كبر مساحة شبة جزيرة سيناء وصعوبة حصرها وطول المسافات بين أماكن تجمع السكان هذا بالإضافة لصعوبة الوصول الى التجمعات السكانية حيث هناك مجموعات تحيا على الترحال والتنقل الدائم وراء الماء والكلأ .
- صعوبة الوصول الى التجمعات الصغيرة والمتفرقة من السكان بين الجبال و فى مخرات السيول مما استلزم ذلك السير لمسافات طويلة على مدقات أو أرض غير ممهدة وقد نضطر الى السير لمسافات طويلة دون العربات المجهزة للمناطق الصحراوية حتى نتمكن من الوصول الى هذه التجمعات .
- عدم تقبل العديد من البدو التعامل مع الغرباء لحرصهم الشديد على خصوصيتهم .
- ورغم صعوبة الحصول على البيانات أدت حرارة الجو لزيادة هذه الصعوبة حيث كان العمل فى شهر أغسطس وهو ما يناسب بعض أفراد فريق العمل .
- تشير الخريطة شكل (١) الى أماكن العمل الميدانى

المستوى التعليمى لعينة الدراسة (على – متوسط – جامعى)

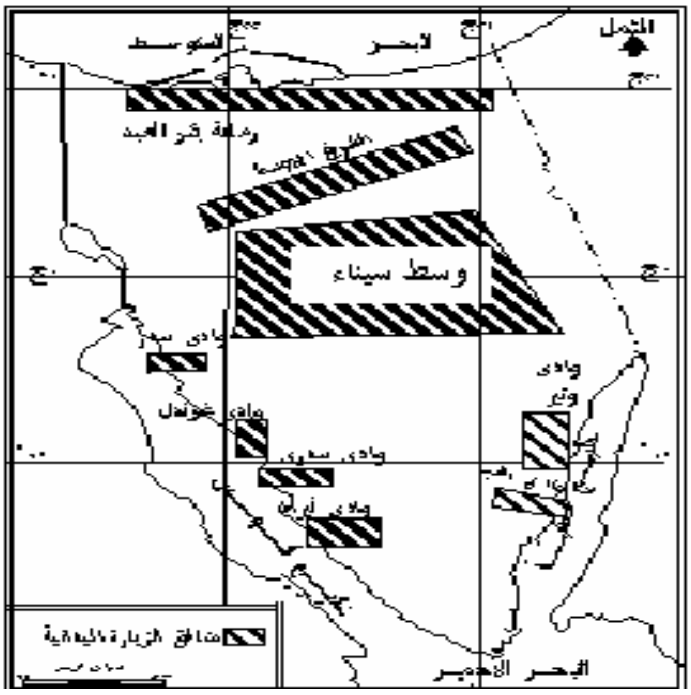
المؤهل	التكرار	النسبة
أمى	٢٥٠	٥٠%
متوسط - جامعى	٢٥٠	٥٠%

لوحظ أن نسبة المؤهلات العليا قليلة ونادرة و أكثر منها نسبيا المؤهلات المتوسطة وأن انتشار نسبة الأمية فى العينة بنسبة ٥٠% يؤكد ضرورة الاهتمام بالخدمات التعليمية حيث أن طبيعة البدو الترحال مع صعوبة حياة الصحراء بمساحاتها الواسعة التى قد تكون حائلا ضد وصول هذه الخدمة بصورة واضحة .

(ج). عينة الدراسة وفقا لطبيعة الاعمال

العمل	تكرار	النسبة
مزارع – رعى	١٢٥	٢٥,٠%
موظف	٢٥	٥%
عامل	١٠٠	٢٠,٠%

نجد أن نسبة الذين يعملون بالرعى والزراعة تصل الى ٢٥,٠%وهى المهنة الرئيسية فى سيناء ولوحقنا فى المهن الاخرى نجدهم ايضا يملكون بعض الموارد الطبيعية كالأرض والمياة والأغنام هم ايضا يعملون على ادارتها بجانب العمل الحكومى.



شكل(٣). خريطة توضح مناطق الدراسة الميدانية فى شبه جزيرة سيناء

جدول (١). عينة الدراسة موزعة للدخل

الدخل فى الشهر	التكرار	النسبة
منخفض أقل من ٥٠٠	٢٥	٢٥%
مرتفع أكثر من ٥٠٠	٧٥	٧٥%

لوحظ أن نسبة الأفراد الذين يقل دخلهم عن ٥٠٠ وصل الى نسبة ٢٥% وهى الأغلبية الذين يمتهنون الزراعة والرعى حيث دخولهم منخفضة لأن مهنتهم تعتمد على الظروف الطبيعية من مطر وريا وطبيعة صحراوية قاسية وبالتالى تؤثر على الجوانب الاقتصادية ، أما الدخول المرتفعة فتما أنهم يجمعون بين أكثر من مهنة كالتجارة والسياحة والمهن الأخرى.

جدول (٢). عينة الدراسة موزعة للحالة الزواجية (متزوج – غير متزوج)

الحالة الزواجية	التكرار	النسبة
متزوج	٩٢	٩٢%
غير متزوج	٨	٨%

يشير الجدول أن البدو المتزوجين نسبتهم ٩٢% حيث أن المجتمع البدوى يعتمد على تقاليده وعاداته الراسخة ومنها الزواج المبكر والزواج بأكثر من واحدة ولذا ترتفع نسبة المتزوجين وقد تكون نسبة الغير متزوجين اما أرمل ، أعزب أو مرحلة تعليمية .

جدول (٣). عينة الدراسة موزعة للنوع (ذكر – أنثى)

النوع	التكرار	النسبة
ذكر	٩٦	٩٦%
أنثى	٤	٤%

يشير الجدول الى أن نسبة الذكور فى العينة ٩٦% بالمقابل الى ٤% من الإناث وهذا يؤكد احجام دور المرأة فى التقاليد البدوية حيث يقتصر دورها على تربية الأبناء والأعمال المنزلية ورعى الغنم والأعمال اليدوية و أحيانا جمع المحصول .

جدول (٤). عينة الدراسة موزعة لأعداد أفراد الأسرة

العدد	التكرار	النسبة
أقل من ٥ أفراد	١٥	١٥%
٥-٩	٥٩	٥٩%
١٠-١٤	٢٤	٢٤%
١٥- فأكثر	٢	٢%

يوضح الجدول أن نسبة ٥٩% هى أعلى نسبة لحجم الأسر حيث عددها من ٥-١٤ أفراد وأيضا أن ٢٤% لحجم الأسر تضم أكثر من ١٠ أفراد وهذا يوضح أن البدو يفضلون كثرة الإنجاب وأيضا الجمع بأكثر من زوجة حيث أن الحياة الصحراوية رغم قسوة العيش بها إلا أن زيادة عددهم وتجمعهم يساعد على التغلب على البيئة ومواجهتها.

جدول (٤). نتائج دالة الفرق بين الشمال والجنوب في بناء القوه

النوع / المقياس	الشمال (ن=٢٠)		الجنوب (ن=٢٠)		قيمة ت	مستوى الدلالة
	المتوسط	الانحراف (ع)	المتوسط	الانحراف (ع)		
مصادر المياه	٣,٠٠	٠,٠٠	٢,٣٥	٠,٤٨	٤,٦٢	**
ملكية الأرض	١,٠٠	٠,٠٠	١,٧٥	٠,٤٤	٤,٦٢	**
الجوانب المرتبطة بالنسب	٣,٠٠	٠,٠٠	٢,٤٥	٠,٥١	٣,٦٩	**
الجوانب السياسية	٢,٠٠	٠,٠٠	١,٦٥	٠,٤٨	٢,٣٠	*
الجوانب المادية	٣,٠٠	٠,٠٠	٢,٤٥	٠,٥١	٣,٦٩	**
الجوانب الثقافية	٣,٠٠	٠,٠٠	٢,٣٥	٠,٤٨	٤,٦٢	**

** الدلالة عند مستوى ٠,٠١ * الدلالة عند مستوى ٠,٠٥

مناقشة النتائج والتحليل الإحصائي

اظهر الجدول رقم (٤) وجود فروقاً دالة إحصائيا في مستوى بناء القوه مع ملكية مصادر المياه لصالح الجنوب لأن الجنوب هو مجتمع ندره المياه وعند درجة ثقة ٠,٠١ وبمتوسط ٣,٠٠ وبانحراف معيارى ٠,٠٠، حيث يعنى ذلك أن مصدر المياه له تأثير واضح على بناء القوى وهذا يرجع لقلة المياه في الجنوب وصعوبة حفر الآبار لأن الماء بها على أبعاد عميقة هذا بجانب أنها قد تكون مرتفعة فى نسبة الملوحة فلا تصلح للاستعمال وهذا يؤكد أن ملكية الآبار ذات قيمة عالية حتى ولو من الجانب الاقتصادى لأن في الجنوب تباع المياه ويكون سعر الجركن ٢٠ جنيهات ويتم نقلها بعربات النقل إلى التجمعات اليدوية – هذا بالإضافة لاستخدامها لأغراض السياحية والفنادق والموتيلات في شرم الشيخ ودهب ونويبع وسانت كاترين – وبذلك فهى لها تأثير في بناء القوة في جنوب سيناء لأنها مصدر ثروة وتعمل على خلق وبناء المكانة الاجتماعية وأكد ٨٠٪ من سليم من وادى حضره كما أكدها عيد سويلم من وادى غزالة نويبع أن صاحب البئر له حرية التحكم في مياه البئر بالنسبة لمن حوله فيقولون أن المياه في الآبار شحيحة لعدم سقوط الأمطار من عدة سنوات وهناك آبار تصلح للشرب كما في وادى سعال وبئر صغير وهى آبار ملكية خاصة تشترى منها المياه للاستخدام الآدمى أما آبار وادى حضره فهى تستخدم لشرب الأغنام والجمال وقد يصل دخل صاحب البئر من بيع المياه ما بين ٢٥٠ – ٣٠٠ جنيه يومياً حسب السحب من المياه.

وأوضح الجدول وجود فروقاً دالة إحصائيا في مستوى بناء القوه مع ملكية الأراضي لصالح الجنوب وعند درجة ثقة ٠,٠١ وبمتوسط ٢,٤٥% وبانحراف معيارى ٠,٥١. وهذا يرجع إلى أن للجنوب طبيعة تختلف اختلافاً كلياً عن الشمال حيث يوجد به المساحات الواسعة من الأراضي الزراعية التي تتوزع بين الجميع ولكن لندرة الأرض الزراعية فمن يمتلكها يعتبر صاحب ثروة وأيضاً بعد أن ازدهرت السياحة في الجنوب أصبحت الأراضي ذات أسعار عالية ومرتفعة ومن هنا كانت مصدر عظيم للثروة وبذلك أصبحت عامل من عوامل بناء القوة داخل المجتمع البدوى في الجنوب كما أكد ذلك الشيخ محمد سليمان من القرارشة بوادى قيران في دراسة الحالة التي أوضحت أن السياحة أصبحت هى مصدر الرزق للعديد من البدو وارتفعت بسببها أسعار الأراضي وخاصة في المواقع التي يشتريها المستثمرين لإقامة المشروعات السياحية.

أظهر الجدول وجود فروقا دالة إحصائياً في مستوى بناء القوه مع الجوانب المرتبطة بالنسب لصالح الجنوب عند درجة ثقة ٠,٠١ وبمتوسط ٣,٠٠% وبانحراف معيارى ٠,٠٠ حيث أكدت النتائج أن في مجتمع الندرة للمياه يكون التغير الاجتماعي فيه بطئ حيث القبائل هناك تحتفظ بمواطنها الأصلية رغم قلة المياه ويحرص الآباء على غرس الشعور بالانتماء إلى الوحدة

العشائرية وضرورة المحافظة على شرفها وكلما كانت القبيلة ذات أصول عريقة وضاحية تاريخ بين القبائل فى المرده والشهامة والقيم والبطولة والتضامن الأرتعطى المكانة والسلطة لأفرادها وتعطى الهيبة والحظوه لأفرادها وعلى ذلك تساعد بدور كبير فى بناء القوه لأفرادها فيكونوا لهم الوجاهة والهيبة بين القبائل وظهر ذلك فى دراسة الحالة التى تمت فى سانت كاترين وابوردیس حيث أكد المشايخ أن القبيلة والعائلة تورث لأبنائها المكانة الأجتماعية التى يزرع الآباء فى الأبناء الرجولة والشرف والمواقف البطولية والواجبات التى عليهم فينشئون أصحاب هيبة بين أقرانهم.

أوضح الجدول وجود فرقا دالة إحصائيا فى مستوى بناء القوه مع الجوانب السياسية لصالح الجنوب أى مجتمع الندرة عند درجة ثقة ٠,٠٥ وبمتوسط ٥٠% وبانحراف معيارى ٠,٥٠٥ وليس هناك فروق كبيرة بين الجنوب والشمال فى تلك الدلالات فنجد أن الجوانب السياسية تعطى تأثير واضح فى بناء القوه حيث أن البدو لهم عاداتهم وقيمهم فى احترام ذويهم وطاعتهم وخاصة من ينتخبونهم ويمثلونهم بسلطاتهم أمام تنظيمات الدولة مثل أعضاء المجلس المحلى والذى يعمل على تحقيق أهدافهم والعمل على تقديم الخدمات العامة كالتعليم والصحة وغيرها من الخدمات كما هو المسئول عن توصيل طلباتهم إلى المسئولين كما أظهرت دراسة الحالة فى بئر العبد، رأس سدر أن الجوانب السياسية والقوانين البدوية هى المسئولة عن تكوين التنظيمات الخاصة بهم كأعضاء مجالس العرف وأعضاء المجالس المحلية وأعضاء مجلس الشعب والشيوخ والتى تظهر المكانة الأجتماعية العالية وتعطى لهم الوجاهة والسلطة والنفوذ فى المجتمع البدوى – وهم أكثر الأفراد قدرة على حل المشاكل التى قد تكون قائمة بين القبائل و أفرادهاكما أنها تساعد على اتمام العمليات التنموية فى المجتمع المحلى القبلى .

أوضحت النتائج الأحصائية وجود فروقا دالة إحصائيا فى مستوى بناء القوى مع الجوانب المادية لصالح مناطق ندرة المياه عند درجة ثقة ٠,٠١ وبمتوسط ٥٠,٤% وبانحراف معيارى ٠,٤٩٨، وهذا يعنى حيث أن مصدر المياه – والأرض الزراعية – والثروة الحيوانية والمال وهى جوانب مادية امتلاكها يكون من العوامل المهيأة لبناء القوى فى المجتمع البدوى – ونظر لندرة هذه الماديات فى جنوب سيناء إذا فهى ذات قيمة مرتفعة تدى بمالكها إلى مكانة متميزة.

أظهر الجدول أن هناك فروقاً دالة إحصائيا فى مستوى بناء القوه مع الجوانب الثقافية لصالح الجنوب عند درجة ثقة ٠,٠١ وبمتوسط ٥٠,٣% وبانحراف معيارى ٠,٤٥٨ وهذا يرجع إلى أن الجنوب أكثر احتفاظا بالتقاليد والعادات والقيم هذا بجانب أن نتيجة الطبيعة الجغرافية الوعره للجنوب والطبيعة الجيولوجية جعلت الجوانب الثقافية أكثر تواجداً فى الجنوب هذا بجانب أن نسبة الأمية أعلى فى الجنوب عن الشمال وان الحراك الأجتماعى فى الجنوب أقل بكثير عن الشمال ولذا نجد البدو يحتفظ بثقافاتهم وبناءه الأجتماعى والعلاقات القبلية دون تغيير كبير مما أعطى لأفراده قدره اكبر على بناء القوه فى تلك الأماكن وذلك لوجود المهارات الشخصية والفصاحة فى الرأى والشجاعة والخطابة والحكمة والقدرة على إصدار الأحكام السليمة وهذا نتيجة الظروف الأيكولوجية الصعبة فى الطبيعة القاسية فى الجنوب.

المتغيرات الأجتماعية على بناء القوى

وقد تم دراسة بعض المتغيرات الأجتماعية مثل النوع والحالة الزواجية والمستوى التعليمى والدخل والعمل الأجتماعى والمهنى الرئيسية (جداول ٤-٥). وصف وتحليل ومناقشة وتفسير نتائج هذه الجداول حيث كانت الجدولية =

٠,٠٥ عند درجة ثقة ٣,٨٤١

٠,٠١ عند درجة ثقة ٦,٦٣٥

٠,٠٠١عند درجة ثقة ١٠,٨٢٧

جدول (٤). يبين بناء الفئات للجنس

العينة	الشمال		الجنوب		جملة العينة	
النوع	ك	%	ك	%	ك	%
ذكر	٤٤	٤٤,٠	٥٠	٥٠,٠	٩٤	٤٧,٠
أنثى	٥٦	٥٦,٠	٥٠	٥٠,٠	١٠٦	٥٣,٠
المجموع	١٠٠	١٠٠,٠	١٠٠	١٠٠,٠	٢٠٠	١٠٠,٠

كا^2 = ٤,٠٥ غير دالة

يظهر جدول رقم (٤) أن كا^2 = ٤,٠٥ غير دالة حيث أن نسبة ضئيلة جداً من الإناث تمثل ٥٦% وهذا يظهر التقاليد والقيم البدوية التى تحجب دور المرأة فى المشاركة بجانب عدم حيازتها للملكية التى تجعلها بعيدة كل البعد فى هذه المجالات .

جدول (٥). يبين بناء الفئات للحالة الاجتماعية (متزوج – أعزب – مطلق / أرمل)

العينة	الشمال		الجنوب		جملة العينة	
الحالة الزواجية	ك	%	ك	%	ك	%
متزوج	٩٥	٩٥,٠	٩٥	٩٥,٠	١٩٠	٩٥,٠
أعزب	٤	٤,٠	٥	٥,٠	٩	٤,٥
مطلق / أرمل	١	١,٠	٠	٠,٠	١	٠,٥
المجموع	١٠٠	١٠٠,٠	١٠٠	١٠٠,٠	٢٠٠	١٠٠,٠

كا^2= ٠,٠٥ غير دالة

يوضح جدول (٥) أن كا^2= ٠,٠٥ غير دالة وذلك لأن نسبة المتزوجين ٩٥% فى الشمال – ٩٥% فى الجنوب وهذا لاهتمام البدو بتقاليدهم وعاداتهم التى تجعلهم يزوجون ابنائهم فى أعمار صغيرة وهذا يجعلهم أكثر تحملا للمسئولية ويساعدهم الى الدخول فى عالم الرجولة التى تعطيهم مكانة اجتماعية مبكرة تصل بهم الى النفوذ والسلطة والسطوة وبالتالى لبناء القوى .

جدول (٦). يبين بناء الفئات للمستوى التعليمى (أمى – متوسط – فوق المتوسط)

العينة	الشمال		الجنوب		جملة العينة	
المستوى التعليمى	ك	%	ك	%	ك	%
أمى	٣٧	٣٧,٠	٣٣	٣٣,٠	٧٠	٣٥,٠
متوسط	٣٧	٣٧,٠	٣٣	٣٣,٠	٧٠	٣٥,٠
فوق المتوسط	٢٦	٢٦,٠	٣٤	٣٤,٠	٦٠	٣٠,٠
المجموع	١٠٠	١٠٠,٠	١٠٠	١٠٠,٠	٢٠٠	١٠٠,٠

كا^2 = ١,٣٤ غير دالة

يظهر الجدول رقم (٦) أن كا^2 = ١,٣٤ غير دالة حيث أن نسبة الأمية منتشرة فى الجنوب أكثر من الشمال – وأن نسبة التعليم المتوسط فى الشمال مرتفعة هذا بجانب نسبة ٦٠% للتعليم فوق المتوسط وهذا بسبب مامرت به سيناء من حرمان للخدمات التعليمية بسبب الحروب المتتالية التى أثرت على ارتفاع الأمية ولكن نجد أن نتيجة زيادة الدخل فى الجنوب بسبب الأنشطة السياحية والمهن المرتبطة بها أدت الى اتجاه بعض الأفراد لتعليم أبنائهم رغم بعد أماكن تلقى العلم مما زادت من المكانة الاجتماعية ولكن ليست بفارق واضح عن الشمال الذى تتيسر فيه فرص التعليم أكثر من الجنوب .

جدول (٦). يوضح بناء الفرضية الأولى للدراسة

العينة	الشمال		الجنوب		جملة العينة	
الدخل	ك	%	ك	%	ك	%
أقل من ٥٠٠ جنيه	٥٠	٢٥,٠	-	-	٥٠	٢٥,٠
٥٠٠-١٠٠٠	٨٠	٤٠,٠	٤٠	٤٠,٠	١٢٠	٦٠,٠
أكثر من ١٠٠٠	٢٠	١٠,٠	٦٠	٣٠,٠	٨٠	٤٠,٠
المجموع	١٥٠	٧٥,٠	٥٠	٢٥,٠	٢٠٠	١٠٠,٠

كا^2 = ٦٠,٠٠ دالة فيما وراء ٠,٠١

يظهر الجدول رقم (٦) أن كا^2=٦٠,٠٠ دالة فيما وراء ٠,٠١ هناك دلالة تتوضح أن الدخل مرتفع فى الجنوب عن الشمال وهذا يؤكد ازدهار مهنة السياحة والتعدين هذا بجانب بعض الزراعات الممنوعة التى تزرع فى الجنوب – كما أن فى الجنوب قد يتم الجمع بين مهنتين مثل السياحة والصيد – أو السياحة والزراعة والرعى مما يزيد من الثروة التى تؤثر على المكانة الاجتماعية وبالتالى على بناء القوى.

جدول (٧). يوضح بناء الفرضية الثانية للاختلاف عمن إتاوا

العينة	الشمال		الجنوب		جملة العينة	
وجود عمل آخر	ك	%	ك	%	ك	%
نعم	٨٠	٤٠,٠	٤٠	٢٠,٠	١٢٠	٦٠,٠
لا	٧٠	٣٥,٠	١٠	٥,٠	٨٠	٤٠,٠
المجموع	١٥٠	٧٥,٠	٥٠	٢٥,٠	٢٠٠	١٠٠,٠

كا^2 = ٢٥,٠٠ دالة فيما وراء ٠,٠١

يتضح الجدول رقم (٧) أن كا^2 =٢٥,٠٠ دالة فيما وراء ٠,٠١ حيث أن هناك دلالة تتوضح أن الجنوب يوجد فيه مصادر دخل أخرى تجعل الأفراد يمكنهم الجمع بين أكثر من مهنة حيث أظهر الجدول أن ٦٠% فى الجنوب يجمعون بين المهن – أما فى الشمال فنسبة ٤٠% يجمعون بين مهنتين وهذا يؤدى الى زيادة المكانة الاجتماعية بزيادة الثروة وخاصة فى الجنوب عن الشمال. وهذا يؤكد دراسات الحالة التى تمت مع الشيخ سليمان عندما بنوبيع بوادى عزازلة من قبيلة المزينة وأيضاً الشيخ سعد قناطى سليم بنوبيع بوادى أم رمث أن مجتمع ندرة المياه جعلت المهن لاتعتمد على المياه بوفرة مثل مهنة السياحة السفارى أو العمل فى المشروعات السياحية كموظفين أو العمل بتربية الجمال واستخدامها لصالح مهنة السياحة التى تدر الربح الكثير للبدو والذين يعملون فى هذا المجال والتى تكون مصدر ثروة تؤكد المكانة فى بناء القوى.

جدول (٨). يوضح بناء الفرضية الثالثة للمكانة الرفيعة

العينة	الشمال		الجنوب		جملة العينة	
المهنة الرئيسية	ك	%	ك	%	ك	%
مزارع	٤٥	٢٢,٥	٥٥	٢٧,٥	١٠٠	٥٠,٠
موظف	٦٥	٣٢,٥	١٥	٧,٥	٨٠	٤٠,٠
عامل	٣٥	١٧,٥	٥	٢,٥	٤٠	٢٠,٠
سياحة	-	-	٢٥	١٢,٥	٢٥	١٢,٥
تجارة	-	-	٥	٢,٥	٥	٢,٥
صيد	-	-	٥	٢,٥	٥	٢,٥
المجموع	١٥٠	٧٥,٠	٥٠	٢٥,٠	٢٠٠	١٠٠,٠

كا^2 =٥٢,٠٠ دالة فيما وراء ٠,٠١

لوحظ من الجدول رقم (ď) أن كا^{Ď} =ĕĐ,č دالة فيما وراء Č,Čč والتى تؤكد أن هناك دلالة لصالح مجتمع وفرة المياه وأن مهنة الزراعة سائدة بنسبة ĐĒ% فى الشمال بينما مهنة السياحة تسود بنسبة đĎ% وهذا يرجع إلى التباين فى مجتمعات وفرة وندرة المياه. وهذا ما أكدته دراسات الحالة عن محمد عواد تاجر من الرميلات الخرافين شمال سيناء وعودة أبو سويلم سالم من الرميلات العريش أن وفرة المياه تعمل على زراعة الأراضى وأن من يمتلك مورد للمياه قادر على زراعة أكبر مساحة يمتلكها الفرد أو القبيلة وبذلك يكون لديه دخل أعلى وأروة ويكون له مكانة اجتماعية بين أهله وعليه واجبات وحقوق عليهم .

نتائج الدراسة

تناولت هذه الدراسة بناء القوى والعوامل المؤثرة على تواجدها فى شبه جزيرة سيناء حيث أن نظام الملكية التقليدية يعتبر من أهم النظم الاجتماعية وأن ملكية المياه تعتبر من أهم الممتلكات ومصدر معيشتهم علاوه على كلا من المياه والأرض لها قيمتها الاجتماعية بالاضافة إلى قيمتها الاقتصادية فهى ارض الأجداد.

كما أكدت الدراسة أن عامل العصبية ومايمليه على الأفراد من طبيعة متمايزة للبناء القبلى والقواعد والقوانين الصارمة والارتباط بما تمنحه القبيلة من كفالة وعلاقات وثيقه بين وحداتها رغم اختلاف مواقعها إلى جانب ما تفرضه طبيعة هذا المجتمع القبلى للخضوع للقيم وللمعايير وأنماط السلوك التى ينبغى ألا يحيد الفرد عنها التى أدت إلى تماسك جمعى والوقوف صفاً واحد لما يعارض مصالحها حيث يتوارث الأبناء تلك المبادىء مما يجعلهم رجل واحد ويختلفون لأنفسهم المكانة والقوه بينهم وبين القبائل الأخرى وخاصة عندما تكون القبيلة ذات شأن عال بين القبائل .

هذا بالاضافة إلى أن مايحوزه الفرد أو القبيلة من ثروه فى أى صورة من الصور تعطى أفرادها مكانة عاليه بين الآخرين هذا بجانب أن كان أيضاً أكثر فطنة وثقافة وقدرة على إقناع الغير بحكمة التى قد تظهر فى مشاركته فى المجالس العريفة أو مجالس الشيوخ التى تحل المنازعات بين الأفراد بالاضافة إلى التعليم والعمل بالدولة الذى قد يضيف إلى المكانة ولكنه ليس بصورة واضحة فى معظم الأماكن للظروف التى مرت بها سيناء .

كما أن هناك العديد من القيم تجعل من المكانة الاجتماعية تنسب إلى صاحبها مثلما أكدها الشيخ سلامه سليم سويلم من رفح الرميلات مثل أن يكون له حظوه بين الأفراد – محترم عادل – يساهم فى تعديل الأوضاع – يشارك فى المجلس العرفى – له مال يؤكد نفوذه – هادىء الطبع وتحت يداهم – حافظ القيم والعادات ويراعى الآخر – من قبيلة لها شأن وهذه صفات البداوة الأصلية التى أشار إليها ابن خلدون ويخرون من روابط عصبية وعيرتهم على نسبهم ومايسود بينهم من مأزره والدفاع عن ذوى أرحامهم وأقاربهم وهذا يعمل على تحقيق ترابط البناء الاجتماعى واستمراريته .

ولذا كان الدور الذى يقوم به أصحاب المكانة الاجتماعية له شأن فى عمليات التنمية وتطوير المجتمع التقليدى لمالهم من سلطة ونفوذ وتأثير على مجتمعهم وأن الملكية لها أثر واضح وخاصة المياه كمورد رئيسى للحياة فى المناطق الصحراوية.

وهذا بالاضافة بأنه لابد من التعامل مع أصحاب القوة والمكانة الاجتماعية فى القضاء على المعوقات التى تواجه المشروعات التنموية داخل المجتمعات الصحراوية بما لهم من قدرة على توصيل أهداف المشروعات الى أفراد المجتمع والعمل على المشاركة الفعلية للمجتمع لانجاح هذه المشروعات ، مع ضرورة الاهتمام برفع مستوى التعليم والتثقيف لاطلائع بناء القوى حتى يكونوا أقدر على مسايرة الحراك الحضارى .

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WATER RESOURCES AND POWER BUILDING IN SINAI PENENSULA (AN ECOLOGICAL STUDY IN SINAI)

The water considered as the basis of life in the desert and this is for its rarity in the desert environment. So , it had a very great importance as a main fund because it is the main source of life , therefore we can find gathering population around it , and it has an economic importance as it considered as a specifier for actions inside the Bedouin societies . The ownership of water gives the usufruct of the land around its source, the ownership of water also gives the usufruct of another kinds of ownerships, and so there was for the system of ownership of water an effective role in fixing influential, power and authority in the Bedouin societies.

The idea of this research discuss the importance of water and its effect on building power in the society of Sinai.

Research target

The study depends on the scientific method through social survey with sample to acquaintance with the role of water in the areas of rarity and abundance of water on building power in Sinai.

Study tools

The study depends on many tools , and the most important are :

Measure of power building beside a questionnaire application and personal meeting and social debate.

Study field

The study was done on two similar samples from the two societies of abundance and rarity of water in Sinai.

Results

-The study showed that the factor of relationship, the nature of the society, basis and rules select the manners of behavior that the person and the society must cling to it , and the sons must inherit it .

- it proved that what the person or the tribe owns from a wealth, gives a high position between the other tribes.

- the wisdone, intelligence, culture and cogency give a high position to their owner.

-It also clarified that there are a lot of values that gives social position such as justice, respect, sharing, money, rules and habits preservation, defending the oppressed, peaceful and from a tribe that has strong origins.